


DAMES & MOORE

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September 2, 1988

Ms. Sharon Feldstein
 Enforcement Project Manager
 Remedial Enforcement Section (3HW16)
 U.S. Environmental Protection Agency
 841 Chestnut Street
 Philadelphia, PA 19107

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 Hazardous Waste Enforcement Branch
 HW10

Mr. David A. Healy
 Hazardous and Solid Waste
 Management Administration
 Maryland Department of the Environment
 2101 Annapolis Road
 Baltimore, MD 21230

Re: Draft Report Sections
 Final RI Report
 Phase II Remedial Investigation
 Maryland Sand, Gravel and Stone Site
Elkton, Maryland

Gentlemen:

On behalf of the MSGS FRP's, enclosed are draft report sections for the MSGS Phase II RI report. As discussed in our meeting in Elkton, Maryland on July 26, selected sections of the February 16, 1988 Draft RI report can be revised in response to USEPA's May 19 comments, independently of supplemental studies now underway. Sections 1, 2, 3, 4, and 6 have been revised in accordance with USEPA's May 19 comments and our responses of August 19. As detailed comments were not received on the appendices, they are not being resubmitted at this time. An additional appendix containing copies of the original analytical data will also be included.

Your comments on these revised sections would be appreciated. Please call if you have any questions during the course of your review.

Yours very truly,

DAMES & MOORE

John C. Kittridge, P.E.
 Project Manager

cc: Paul Krueger, The BOC Group, Inc.
 Ralph Schmidt, Beecham Laboratories, Inc.
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1.0 INTRODUCTION

1.1 SITE HISTORY

The Maryland Sand, Gravel and Stone (MSGS) site is located in Elkton (Cecil County), Maryland, at 75°53'54" longitude and 30°36'53" latitude on the U.S. Geological Survey (USGS) North East, Maryland, 7.5-minute quadrangle map. Consisting of about 200 acres, the site is located north of U.S. Route 40 and along a tributary to Mill Creek about 3 miles west of the town of Elkton (Figure 1-1). It is situated within the western portion of a triangle formed by Marley Road to the northwest, Nottingham Road to the northeast, and U.S. Route 40 (Pulaski Highway) to the south (Figure 1-2).

The site was previously operated as a sand and gravel quarry under the name Maryland Sand, Gravel and Stone Company. In December 1979, Lester Summers--President of the Maryland Sand, Gravel and Stone Company--informed the Maryland Department of Natural Resources that the site was for sale (Maryland Department of Natural Resources, 1980), although no sale has since transpired.

About 3 acres of the site were used for the disposal of waste processing water, sludge, still bottoms, and about 90 drums of solid and semisolid waste between 1969 and 1974 (Summers, 1975). On July 16, 1974, 1,300 gallons of flammable products stored in drums were reportedly received and dumped; on August 5, 1974, 5,000 gallons of nonflammable materials were received at the site (Summers, 1974). Pits, excavated onsite, were used as surface impoundments, where approximately 700,000 gallons of waste were dumped (Stone and McGovern, 1982).

On April 27, 1974 (1 p.m.), a pool of chemical waste ignited and burned at high intensity before it was extinguished. The cause of the fire was not determined (Hill, 1974).

Two hundred thousand gallons of liquid waste were removed in 1974. The drums and sludges that remained were buried onsite in excavated pits (NUS Corporation, 1983).

Numerous seeps were observed during a site reconnaissance by the remedial investigation/feasibility study (RI/FS) team. Several seeps are located south of pond PO1, one seep is in the wooded area east of pond PO2, and other seeps are located downgradient on a hillside west of pond PO3 in the Sedge Meadow Area.

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The seeps and surface water runoff from the western and southern sections of the site drain into the western tributary of Mill Creek. The Sedge Meadow Area is a hillside located downgradient between pond PO3 and the western tributary of Mill Creek. Runoff from the eastern portion of the site drains to the eastern tributary of Mill Creek.

A portion of the site located west of the Sedge Meadow Area has undergone excavation; however, the exact nature of the activities that occurred in this area is unknown.

1.2 PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

A history of site use, permit and regulatory actions, and remedial actions is presented in Appendix A of the Phase I RI.

The Phase I RI/FS was performed at the MSGS site by AEPCO, Inc., under subcontract to NUS Corporation, a regional contractor for the U.S. Environmental Protection Agency (USEPA). The objectives of that RI/FS were to:

- Characterize the types and extent of contamination
- Evaluate alternative remedial actions for the MSGS site
- Recommend a cost-effective remedial action.

The findings of the Phase I RI/FS are presented in the report dated September 4, 1983.

Several unresolved issues were identified as a result of the waste and environmental sampling and analysis program that was conducted during the Phase I RI/FS, namely:

- The existence or absence of contamination in the two deeper aquifers--the unconsolidated deep and bedrock aquifers.
- The existence or absence of a contamination source in the Western Excavated Area of the site.
- The determination of the extent of soil contamination on site.

Further study and review of these issues by AEPCO, Inc. (NUS Corporation subcontractor), USEPA, State of Maryland Department of Health and Mental Hygiene, and NUS Corporation (USEPA contractor) revealed that the conduct of a supplementary RI/FS (Phase II) would be necessary.

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1.3 OBJECTIVES OF THE PHASE II REMEDIAL INVESTIGATION

The objectives of this Phase II RI for the MSGS site are:

- Evaluate the existence or absence of contamination in the two deeper aquifers, which underlie a shallow aquifer; the unconsolidated deep and bedrock aquifers.
- Evaluate the existence or absence of a contamination source in the Western Excavated Area of the site.
- Evaluate the extent of soil contamination onsite.

1.4 OVERVIEW OF THE REMEDIAL INVESTIGATION REPORT

Section 2.0 of this report presents general descriptions of demography, land uses, natural resources, and climatology that are applicable to the site.

Section 3.0 presents results of the hazardous substances investigation.

Section 4.0 discusses the findings for studies of soils contamination.

Section 5.0 is an evaluation of the hydrogeology of the site and of the nature and extent of groundwater contamination.

Section 6.0 provides a summary of the surface water hydrology and sediment investigations.

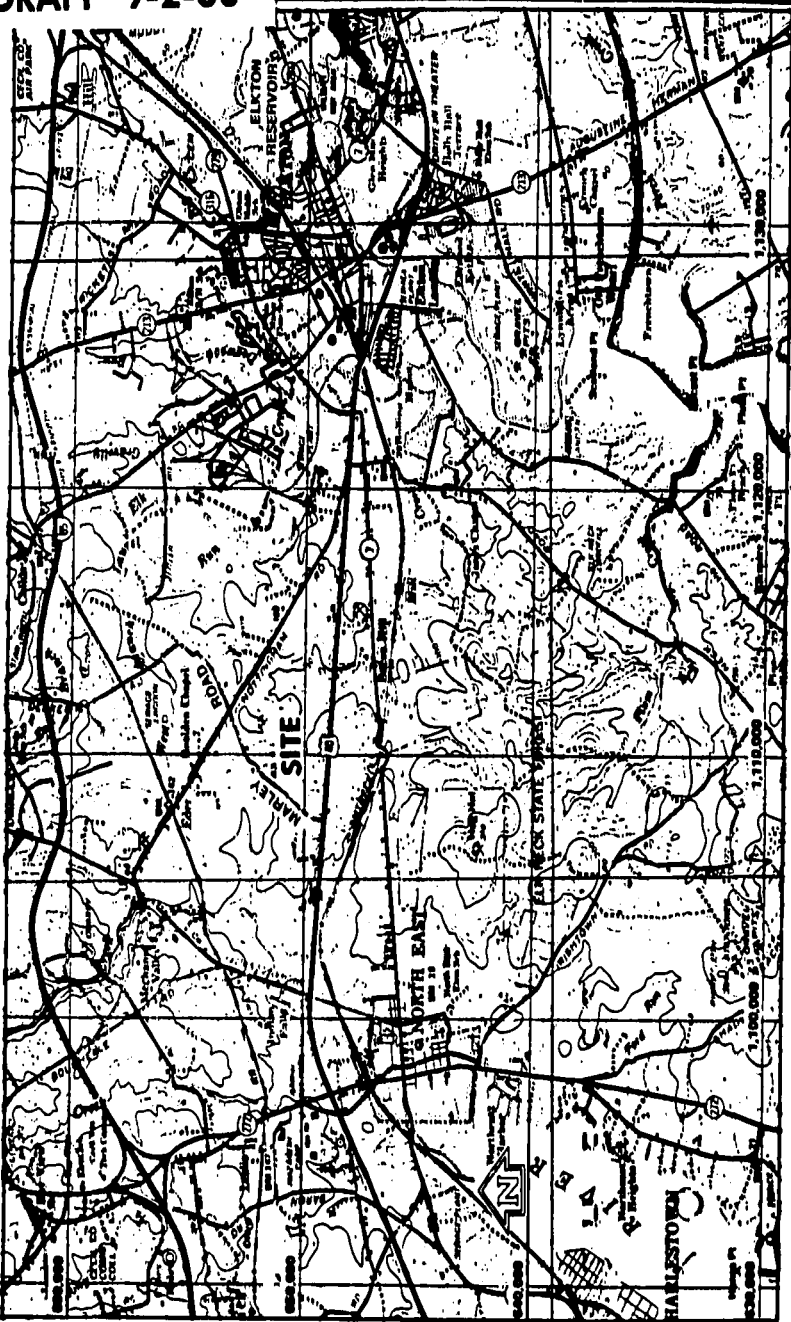
Section 7.0 is an assessment of the health risks and environmental concerns related to the site.

Section 8.0 presents the conclusions of the Phase II RI.

Section 9.0 presents references cited for this report. Supporting data are provided in the appendices.

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Source: Topographic Map of Cecil County, Maryland Geological Survey, 1977

0 2000 Feet

FIGURE 1-1
VICINITY MAP

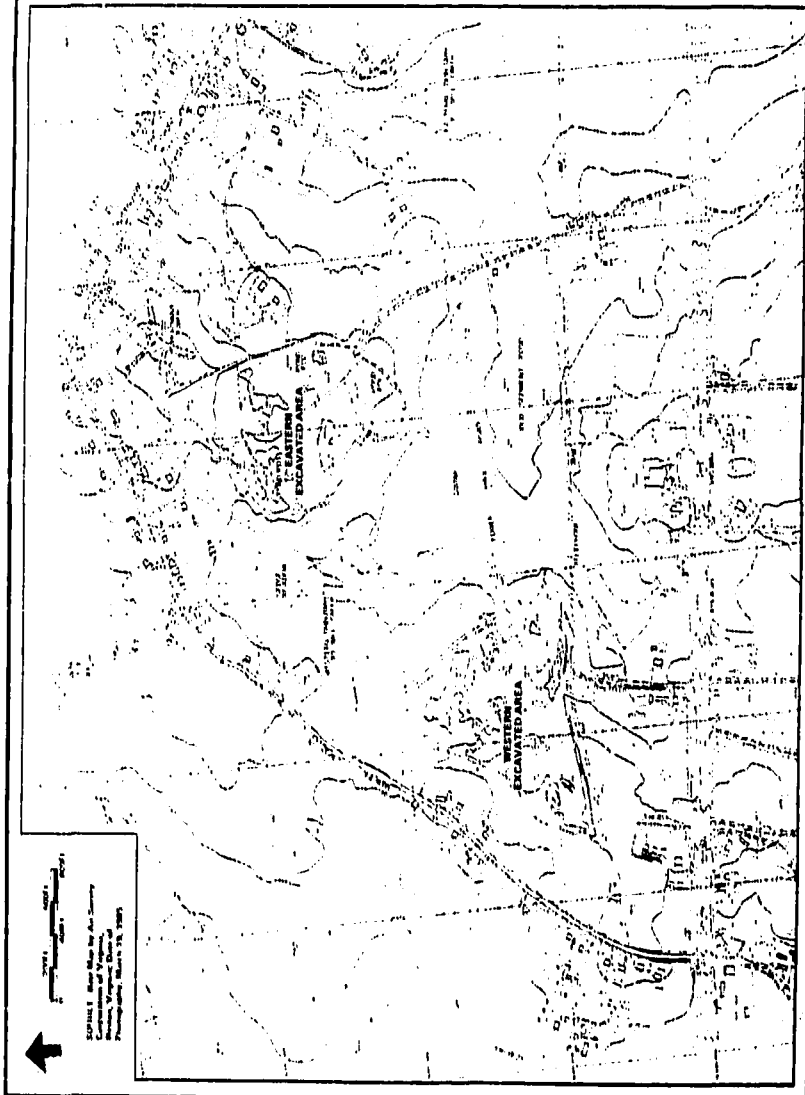
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FIGURE 12
SITE MAP
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Revised 8 March 1968



0 100 200 300 400 500 600 700 800 900 1000
0 10 20 30 40 50 60 70 80 90 100
Feet
Meters

EXPLANATION: Map Map of the
Location of the
Excavated Area
Revised 8 March 1968

2.0 SITE FEATURES INVESTIGATION

General site-specific information concerning demography, land use, natural resources, and climatology are presented in Section 2.0.

2.1 DEMOGRAPHY

Cecil County has a population of 60,428, as recorded in January 1984 (Maryland Department of Economic and Community Development, 1984), with a population density of about 172 persons per square mile. This represents approximately 1.5 percent of the total population of Maryland, as recorded in 1980 by the U.S. Bureau of the Census and the Maryland Department of State Planning. Table 2-1 shows the population distribution in Cecil County by sex for various age groups. Within a 1-mile radius of the site, there are approximately 150 units housing about 570 residents (Ecology and Environment, Inc., 1982).

The population projection for the years 1985, 1990, and 2000, as estimated by the U.S. Bureau of the Census and the Maryland Department of State Planning, shows a steady growth pattern of 63,500, 66,600, and 70,800, respectively (Maryland Department of Economic and Community Development, 1984).

Elkton, a town of 6,468 residents according to the 1980 Census report (Maryland Department of Economic and Community Development, 1984), is located approximately 3 miles to the east of the site. The town of North East, located approximately 1.8 miles west-southwest of the site, has a population of 1,469.

2.2 LAND USE**2.2.1 Regional Land Use**

Cecil County, located in the northeastern corner of Maryland, is one of the smallest counties in the state, covering only 3,552 square miles. The county is bounded by Pennsylvania to the north, Delaware to the east, Kent County along the Sassafras River to the south, and the Chesapeake Bay and the Susquehanna River to the west. U.S. Route 213 runs north and south in the county, intersecting the Pulaski Highway, U.S. Route 40. U.S. Route 40, as well as Interstate I-95, runs east and west. The inland waterway cuts across the county in the Chesapeake and Delaware Canal.

Cecil County is becoming less of a rural area partially because of the influence of the growing northern Delaware metropolitan area. Many of the county

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residents who work as production-line employees and in business commute to Delaware to the east and to two U.S. Department of Defense installations in Harford County to the west (U.S. Department of Agriculture, 1973).

Slightly less than 3 percent of the total land, or 6,191 acres, is used for cultivated crops, and about 2 percent (4,526 acres) of Cecil County land is better suited for intensive use as pasture. These pasturelands occupy long, narrow strips along the major streams of the county and are not suited for cultivation because of periodic flooding and poor internal drainage. About 7 percent (15,708 acres) of the land is suited for moderate use as pastureland (U.S. Department of Agriculture, 1973).

The soils in about 5 percent of the county (11,644 acres) are better suited for trees than for cultivated crops because they are steep, rough, droughty, or eroded. The trees provide protection for the watershed and have aesthetic value.

The county has considerable recreational land. Summer cottages abound along 120 miles of county waterfront and marinas along the shore. Migratory waterfowl are hunted along the shores and in the fields of the county during the fall and winter.

Industrial development has also progressed in recent years, as exemplified by the production of major chemicals, rubber products, rocket motors, textiles, and industrial wire and cable. Small industries include home construction, luggage manufacture, and medical products.

The county's educational facilities consist of 27 public schools (16 elementary, four middle, and five high schools and two vocational-technical and special education centers), with an enrollment of 12,236, as reported in 1983-1984 (Maryland Department of Economic and Community Development, 1984). There are 13 private schools, with an enrollment of 1,800 students.

2.2.2 Local Land Use

Land use onsite and within an approximate 1.5-mile radius around the site can be categorized as follows, as of June 1983 (Mata, 1983):

- Urban or builtup land (residential, commercial, industrial, transportation/commercial, utilities, and mixed urban and builtup land).
- Agricultural (cropland and pasture and farmsteads and farm-related enterprises).

- Range (shrub-brush and mixed range).
- Forest (deciduous, evergreen, mixed, and clear-cut).
- Water (natural lakes and ponds and manmade reservoirs and impoundments).
- Barren land (extractional and transitional).

Land use at the project site and within the vicinity of adjacent Marley Road, Nottingham Road, and U.S. Route 40 is categorized below:

<u>Land Use</u>	<u>Area (%)</u>
Mixed forest	55
Clear-cut forest	1-5
Residential	11
Commercial	2
Cropland and pasture	17
Barren lands	11
Mixed urban/builtup land	2
Manmade reservoirs	0-5

Residents near the site rely almost exclusively on groundwater for their water supply and on septic tanks/absorption fields for the disposal of their domestic sewage. Municipal water from Elkton is gradually being extended westward toward the site.

2.3 NATURAL RESOURCES IN THE VICINITY OF THE MSGS SITE

The site covers approximately 200 acres, with two major excavated areas in the eastern and the western portion of the site. The site contains three ponds (PO1, PO2, and PO3), the Sedge Meadow Area, a swamp, an Old Sedimentation Pond, and an upper reach of the western tributary of Mill Creek. The western tributary of Mill Creek, originating at the Sedge Meadow Area, dissects the site, initially flows southward, then turns east south of the Old Sedimentation Pond and joins the eastern tributary of Mill Creek offsite directly east of Ephrata Lane. The eastern tributary of Mill Creek lies about 1,000 feet east of the site and flows south, roughly paralleling Ephrata Lane. Some runoff and seepage from the extreme eastern portion of the site enters the eastern tributary. A number of seeps, springs, and intermittent streams are also present at the site. All of the seeps and streams eventually feed to the western tributary of Mill Creek. Several low-lying areas are mostly dry but occasionally fill with water after precipitation.

Most of the site is visually buffered by wooded areas from adjacent properties and roadways, including U.S. Route 40 (Pulaski Highway) to the south, Marley Road to the northwest, and Nottingham Road to the northeast. Nevertheless, traffic noise from U.S. Route 40 is noticeable near the Lower Haul Road, approximately 1,200 feet north of U.S. Route 40.

Other unique onsite features are listed below:

- The site--once a source of sand, gravel, and stone--has been inactive for some time. As a result of the extraction activities for these materials, the site has been drastically modified and is now characterized by undulating terrain. The highest point is 188.5 feet above mean sea level (msl), and the lowest spot at the southeastern corner of the site is just below 94 feet above msl.
- The area surrounding the site is mostly residential. Groundwater is the primary source of drinking water for these residents.
- Seeps are visible directly downgradient from pond PO1, in the wooded area east of pond PO2, and in the Sedge Meadow Area immediately downstream from and west of pond PO3.
- A telephone right-of-way runs along the southern edge of the site.

Additional discussion on wetlands and biota at and near the site can be found in Sections 5.5 and 7.0 of the Phase I RI report (AEP CO, Inc., 1985). A supplemental bioassessment study will be forwarded as a separate report.

2.4 CLIMATOLOGY

Cecil County is characterized by a humid, continental climate with well-defined seasons. The Chesapeake Bay and its tributaries and the Atlantic Ocean affect the climate, particularly by moderating extreme temperatures. Table 2-2 shows climatic data for the county, based on Elkton records (National Weather Service, 1941-1960).

The warmest part of the year is during the last half of July, when the maximum afternoon temperatures average near 90°F. Temperatures of 90°F or higher occur about 34 days per year. The coldest period is during late January and the beginning of February, when early morning temperatures average 22°F. The average number of days with temperatures less than 32°F is 111.

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Freeze data for the spring and early fall are shown in Table 2-2. The growing season between the last 32°F temperature in spring and the first one in fall averages 181 days at Elkton.

The annual precipitation at Elkton has ranged from a low of 26.96 inches in 1930 to a high of 58.01 inches in 1945. The monthly distribution of precipitation, however, is fairly uniform throughout the year, with slightly higher precipitation levels during August.

The maximum total precipitation for any one month was measured at 15 to 18 inches in August 1955, when two hurricanes crossed Maryland. The average annual snowfall is 21 inches, but there is considerable variation from year to year, ranging from a trace in 1949 to 58.8 inches in 1958. The chances of drought occurring are very low. Generally, the rainfall and stored soil moisture are adequate for good crop growth, but in some years the unequal distribution of summer showers and occasional dry periods at critical stages in crop development made irrigation necessary for maximum crop growth.

Thunderstorms occur on the average of about 30 days per year, with hail occurring about 1 or 2 days per year. Tornadoes are rare and have caused very little damage in the past. Tropical storms affect the county about once each year, usually during August through October. Most of these have caused only minor damage.

Prevailing winds are from west-northwest to northwest, especially in winter months. From May through September, the area is dominated by southerly winds. The average annual windspeed is about 9 or 10 mph. Wind speeds reach 30 to 60 mph and even higher during severe thunderstorms, hurricanes, or winter storms.

TABLE 2-1

Population Distribution of Cecil County, Maryland

<u>Age</u>	<u>Males</u>	<u>%</u>	<u>Females</u>	<u>%</u>	<u>Total</u>	<u>%</u>
Under 5	2,155	7.1	2,059	6.8	4,214	7.0
5-19	8,887	29.4	8,216	27.2	17,103	28.3
20-44	10,749	35.6	10,874	36.1	21,623	35.7
45-64	6,014	19.9	5,923	19.6	11,937	19.8
65 and over	<u>2,427</u>	<u>8.0</u>	<u>3,124</u>	<u>10.3</u>	<u>5,551</u>	<u>9.2</u>
Total	30,232	100.0	30,196	100.0	60,428	100.0

Source: Maryland Department of Economic and Community Development, 1984.

TABLE 2-2

**Temperature and Precipitation at
Elkton, Cecil County, Maryland**

Month	Temperature (°F)				Precipitation (inches) ^b		
	Average Daily Maximum	Average Daily Minimum	Maximum ^a (equal to or higher than)	Minimum ^a (equal to or lower than)	Average Total	Less Than	More Than
January	42.4	25.1	60	10	3.46	1.9	6.3
February	44.2	24.9	60	13	2.99	1.9	4.5
March	52.8	31.4	72	19	4.19	2.1	6.3
April	64.9	40.7	82	29	3.60	1.4	6.9
May	75.7	50.8	88	39	4.25	1.4	7.7
June	84.0	59.6	94	48	3.96	1.7	7.4
July	87.9	64.5	96	55	4.35	1.0	8.0
August	86.1	62.9	95	51	5.02	1.4	9.4
September	79.7	55.9	91	42	3.56	1.0	7.1
October	68.6	44.4	84	32	3.23	1.6	6.0
November	56.1	34.6	69	24	2.55	0.8	6.4
December	44.2	26.3	60	12	3.19	1.3	5.8
Yearly	65.6	43.4	99	2	45.35	37.0	52.6

Source: National Weather Service, U.S. Department of Commerce, 1941-1960.

^aData are based on estimates for 1 year in every decade.

^bPredicted precipitation for 1 year in every decade.

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3.0 HAZARDOUS SUBSTANCES INVESTIGATION

3.1 WASTE INFORMATION

The site was previously operated as a sand and gravel quarry under the name Maryland Sand, Gravel and Stone Company. Mining of the sand and gravel resource was focused in two areas on the property--the Eastern Excavated Area and Western Excavated Area, respectively, as identified in Figure 1-2.

Use of the site for waste disposal occurred concurrently with the decline of the property as a source for sand and gravel. The Eastern Excavated Area investigated for the Phase I RI/FS was used for the disposal of industrial and hazardous wastes over a period of several years between 1969 and 1974. Available information indicates that wastes were transported and disposed of by several parties and by several methods, as discussed below. The disposal of wastes in the Western Excavated Area has not been identified in available information, although estimated data from the Phase I RI/FS inferred that waste disposal may have occurred (see Section 3.2).

Bulk liquid wastes comprised the majority of materials disposed of at the site. Pits, excavated onsite, were used as surface impoundments, where roughly 700,000 gallons of waste were reportedly dumped. Of this total, roughly 405,000 gallons were segregated manufacturing wastewaters that had previously been discharged to the Elkton municipal sewer system. These industrial wastewaters resulted from cleaning of equipment used for manufacturing a polyvinyl acetate-based emulsion (that is used in some cases for FDA-approved products) and from a unit producing dibutyl maleate ester at the same plant. These wastes were disposed of at the site under a permit issued by the State of Maryland in 1969. Beginning in May 1971, the same wastewaters were shipped to the site in drums. It is not known if the drums were emptied or recycled.

The remaining bulk liquids came from a variety of sources, including flammable liquids that burned in a fire of undetermined origin in April 1974. Specific chemical compositions of wastes deposited at the site are unavailable. Nevertheless, the wastes are alleged to contain a variety of materials including acetone, chlorobenzene, dichlorobenzene, dimethyl formamide (DMF), 1,4-dioxane, ethyl acetate, linseed oil, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, perchloroethylene, toluene, trichloroethylene, waste oil, and xylene.

Later in 1974, several responsible parties undertook the removal of roughly 200,000 gallons of liquid hazardous waste from the site. Sludges and drummed hazardous substances remaining after that removal operation were buried in excavated pits onsite. Also buried with the remaining materials were one or two waste-filled, 2,000-gallon concrete mixer drums. Based on an initial site investigation in July 1979, USEPA found that several unlined lagoons had been used to dispose or store various industrial and chemical wastes containing hazardous substances. No additional cleanup of the lagoon areas has since occurred.

Drum shipments from at least two sources have also been identified as having been disposed at the site. A group of 90 drums, more or less, was identified and investigated by the State of Maryland in 1975. These drums (about 80 open-ended drums containing block calcium chloride, caustic soda, wood, and paper trash and about ten closed drums containing semisolid polymer waste containing residual lacquer solvent) were left in place and covered with a clay cap.

An additional 938 drums of polymer sludges were shipped to the site in 1971-1972. These drums were generally shipped on pallets, and both open and closed drums were used. Information is not presently available as to whether the drums were disposed of intact at the site or whether they were emptied.

During the time period 1974-75, the State of Maryland's activities at the site were limited to a series of regulatory activities pursuant to State environmental statutes.

3.2 RESULTS OF PHASE I STUDIES

The scope of the Phase I RI waste investigation performed by a USEPA subcontractor was determined based on a visual inspection of the site and a review of available information on disposal practices at the site. Based on the above, suspected waste types and disposal areas were:

- o Semisolid and/or solid materials in the ponds (P01, P02, and P03), the swamp north of Lower Haul Road, and the Sedge Meadow Area in the head-waters of the western tributary of Mill Creek.
- o Corroded and empty drums on the soil surface in pond P01.
- o Drummed and/or containerized wastes buried underground in areas near spill piles immediately east, immediately north, and about 250 feet northeast of pond P01 and directly north and southwest of pond P02.

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- Contaminated soils beneath and in the immediate vicinities of ponds P01, P02, and P03.
- Debris or spoil piles on the eastern slope of pond P01.

These areas were investigated by a series of tasks that included direct waste sampling and sampling of surface soil, surface water, sediment, and shallow groundwater, supplemented by geophysical studies. The Phase I findings (shown on Figure 3-1) regarding wastes in the Eastern Excavated Area are:

- The only hazardous wastes, as defined in EP toxicity tests or Resource Conservation and Recovery Act (RCRA) standards, are present in and near pond P02. This waste has a low flash point, contains elevated concentrations of volatile organic compounds (VOC's), and presents a fire hazard.
- Wastes are present in ponds P01, P02, and P03.
- Geophysical survey data reveal that metallic containers are possibly buried near spill piles immediately east of pond P01, in areas immediately north of and about 250 feet northeast of pond P01, and directly north and southwest of pond P02. Assuming that all of the metallic containers are intact 55-gallon steel drums, which are buried at a depth of about 12 to 15 feet, there is an estimated total of about 1,030 drums at these locations.
- Elevated concentrations of VOC's were observed in wastes in pond P02, in seeps in the eastern wooded area, in the Sedge Meadow Area, and in the seep south of pond P01. Most of these organic wastes were probably disposed on or near the surface. VOC's found in elevated, approximated concentrations included methylene chloride (5 of 12 samples, up to 400 ug/kg), acetone (6 of 12 samples, up to 4,000 ug/kg), chloroform (4 of 12 samples, up to 110 ug/kg), 2-butanone (1 occurrence at 380 ug/kg), and chlorobenzene (3 of 12 samples, up to 190 ug/kg). Also encountered, but at low concentrations, were trichloroethene (1 occurrence at 7.8 ug/kg), 2-chloroethyl vinyl ether (1 occurrence at 4.9 ug/kg), and toluene (6 of 12 samples, at 1.8 to 39 ug/kg). Di-n-butylphthalate was the most frequently observed acid and base/neutral extractable organic compound observed (7 of 12 samples, up to 23,000

mg/kg). Also observed were diethylphthalate (1 occurrence at 990 ug/kg), butylbenzylphthalate (1 occurrence at 130 ug/kg), bis (2-ethylhexyl) phthalate (2 occurrences, 120 and 260 ug/kg), and benzo (a) pyrene (1 occurrence at 6,200 ug/kg).

- Potentially elevated concentrations of the pesticides heptachlor and endosulfan sulfate may be present in the wastes in pond P02.
- No polychlorinated biphenyls (PCB's) were detected in any of the 13 onsite waste samples.

The scope of work for the Phase I RI also included very limited waste and surface soil sampling in the Western Excavated Area, commensurate with the understanding that waste disposal had not occurred in that area. The investigators did not sample wastes, per se, as there were no obvious wastes. A sample was taken in a disturbed area that would have been convenient for waste disposal. Estimated but positive identification of certain hazardous substances was found at one soil station and one waste sampling station--WS-06 and SSS-11--respectively (it should be noted that, as shown on Figure 3-1, these two stations are at nearly identical locations and were the only sampling stations in the Western Excavated Area). The surface soil and wastes samples were not analyzed for acid and base/neutral extractable organic compounds and pesticides/PCB's, and no elevated levels of metals were found. The contaminants found and their estimated concentrations in micrograms per kilogram (ug/kg, ppb) are summarized below:

<u>Station WS-06</u>	<u>Depth (6 inches)</u>
Methylene chloride	7.4 J*
Acetone	310 J
Chloroform	9.1 J
Toluene	5.8 J
Benzene	1.2 J
Trichloroethylene	4.6 J

*"J" values in the Phase I report are listed as "approximated."

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In addition to the above contaminants, the results of an EP toxicity test on the WS-06 sample indicated an arsenic level of 8 ug/l. Similar levels were found in all waste samples taken, and all levels were well below the RCRA standard of 3,000 ug/l. One tentatively identified compound, 4-hydroxyl-4-methyl 2-pentanone, was found at a level of 69,000 J ug/l. This compound was found at comparable levels in most of the waste samples from the site. Total organic carbon (TOC) and total organic halogen (TOH) levels were 453 mg/kg and 94.3 mg/kg, respectively. These values compare with most other waste samples. Volatiles analyses for SSS-11 provided the following (in units of ug/kg):

<u>Station SSS-11</u>	<u>Depth (6 inches)</u>	<u>Depth (3 feet)</u>
Methylene chloride	ND*	770 J**
Acetone	670 J	2,700 J
Chloroform	ND	700 J
Toluene	15 J	ND

Metals analysis for SSS-11 yielded the following values (in units of mg/kg):

	<u>Depth (6 inches)</u>	<u>Depth (3 inches)</u>
As	0.2	2.70
Be	0.023	0.073
Cd	<0.013	<0.013
Cr	14.0	42.2
Cu	3.0	10.0
Pb	1.33	1.93
Mn	53	53
Hg	ND	ND
Se	<0.2	<0.2
Ag	0.103	0.093

*ND = Not detected.

**"J" values in the Phase I report are listed as "approximated."

As a result of the above data, the Western Excavated Area was targeted for more intensive study in the Phase II RI.

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3.3 PHASE II INVESTIGATIONS--MAGNETIC LOCATOR STUDIES

Dames & Moore initiated the Phase II RI in November 1985, which included several subtasks that contributed to an evaluation of the extent of surface and near-surface soil contamination in the Western Excavated Area and determination if a contamination source(s) is present in the Western Excavated Area. The scope included geophysical studies, surface soil sampling (see Section 4.2), and shallow borings (see Section 4.3). A waste sampling was initially included but subsequently deleted, as discussed below.

Subtask 9, Geophysical Studies, includes magnetic locator studies in two areas--the Western Excavated Area and the Old Sedimentation Pond. The surveys were conducted to evaluate the existence and extent, if any, of buried ferromagnetic objects.

3.3.1 Western Excavated Area

A magnetic locator survey of the Western Excavated Area, for which no waste disposal was documented or known but which was suspected of containing wastes due to the sampling results from Phase I, was conducted in December 1985 by Mr. Bruce Bevan of Geosight, a subcontractor to Dames & Moore. The area surveyed was laid out on a 50-foot grid, the same grid system used for the surface soils screening studies. A total of 512 spatial measurements were made using a Scintrex MP-2 proton magnetometer, and a second magnetometer was stationed at one location on the site to measure the temporal change in the magnetic field.

The results of the survey are shown in Figure 3-2. The contoured magnetic map shows a large-area magnetic gradient that could be caused by deep or distant geological contacts. The extreme topography of the pit and surrounding hills causes little or no effect.

Seven small-area magnetic anomalies are marked with lettered squares. All but one (anomaly C) have ready explanations, with nonwaste-related iron visible at the surface. It does appear that there could be buried iron weighing roughly 100 pounds near N 650,110 E 1,109,322 (a magnetic high of 55,050 nanotesla (nT) was found near N 650,100 E 1,109,325, and a magnetic low of 54,640 nT was found near N 650,120 E 1,109,320). This type of north-south-oriented, low-high pattern was found at most of the anomalies and is typical.

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The strongest magnetic anomaly--F at E 1,109,700 N 630,230--is caused by an abandoned automobile. It shows that a significant mass of iron can cause anomalous magnetic measurements at four points. No other anomalies approached this magnitude. None of the anomalies are believed to represent large masses of buried iron. The complete report is provided in Appendix A.

3.3.2 Old Sedimentation Pond

Dames & Moore performed a preliminary survey in April 1986 of the Old Sedimentation Pond, located in the eastern area of the site, using a metal detector. The equipment used was a White's Electronics TM-600 metal detector, capable of locating small objects within 2 to 3 feet of the ground surface and larger objects (e.g., 55-gallon drums) 6 to 8 feet underground.

The surveyed area was laid out as shown in Figure 3-3, using well DMW-03 as the zero point. Eleven lines at a 100-foot parallel spacing were laid out, terminating at the eastern limits of the pond. Access to the southern end of the 0-through 300-foot lines was difficult due to soft, wet ground and high swamp grass.

Each line was slowly traversed, holding the TM-600 at arm's length and sweeping from side to side. Additional traverses were made at intermediate spacings between the main grid lines. At points of detection, a shovel was used to uncover any objects at shallow depths. Seven isolated detections were found, as shown in Figure 3-3. These were all determined to be shallow scrap metal. Two other areas had four and five detection points, respectively, as shown in Figure 3-3. Objects at these locations were deeper than the 24-foot depth excavated by shovel. All of the objects appeared to be isolated items, ranging from very localized to about two paces (6 feet) in area, and were not strong detections.

The results of the metal detector survey did not disclose evidence of large masses of buried iron in the Old Sedimentation Pond area. More detailed work using a magnetic locator was not indicated.

3.4 SUMMARY AND FINDINGS

The findings of the Phase I RI indicated the slight possibility of contamination in the Western Excavated Area, an area not known to be used for disposal. The geophysical studies performed for the Initial Phase II RI tasks did not encounter evidence of buried metallic wastes or other indications of contamination source(s) in the Western Excavated Area.

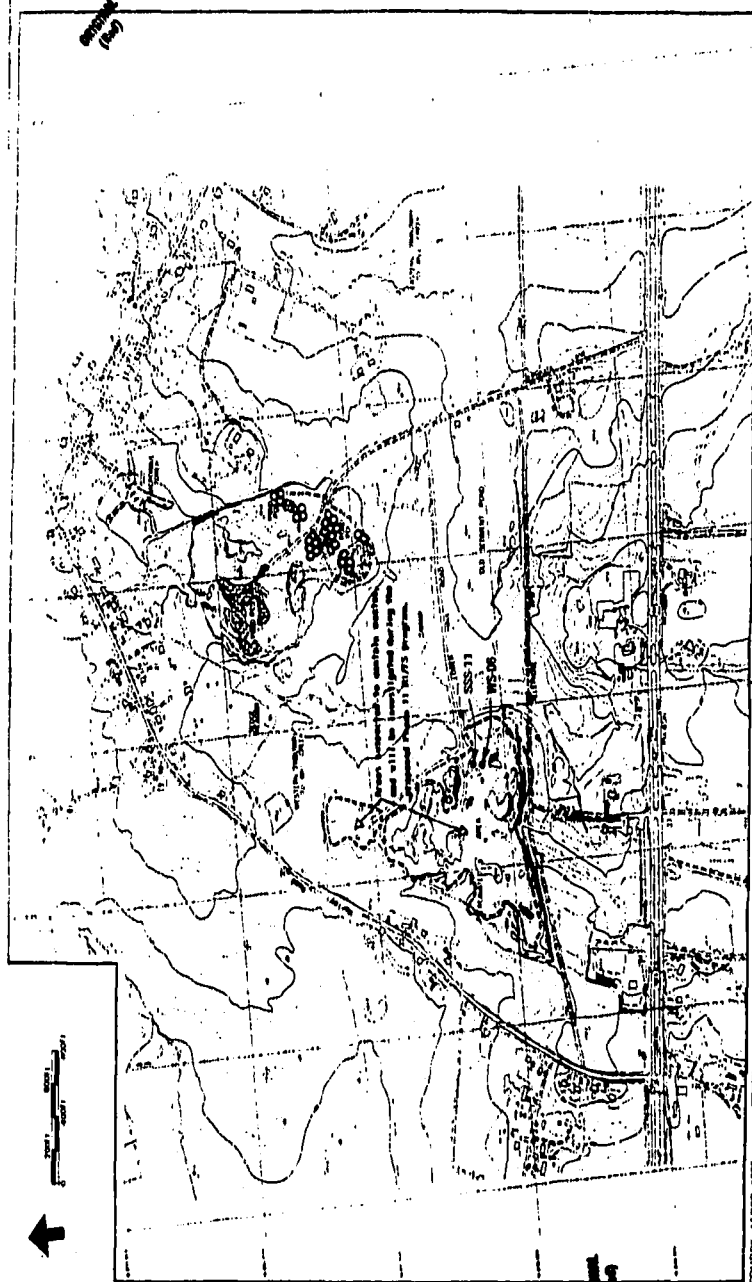


FIGURE 3.1
WASTE LOCATIONS IDENTIFIED
IN PHASE 1 RIFTS

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ORIGINAL
(Red)

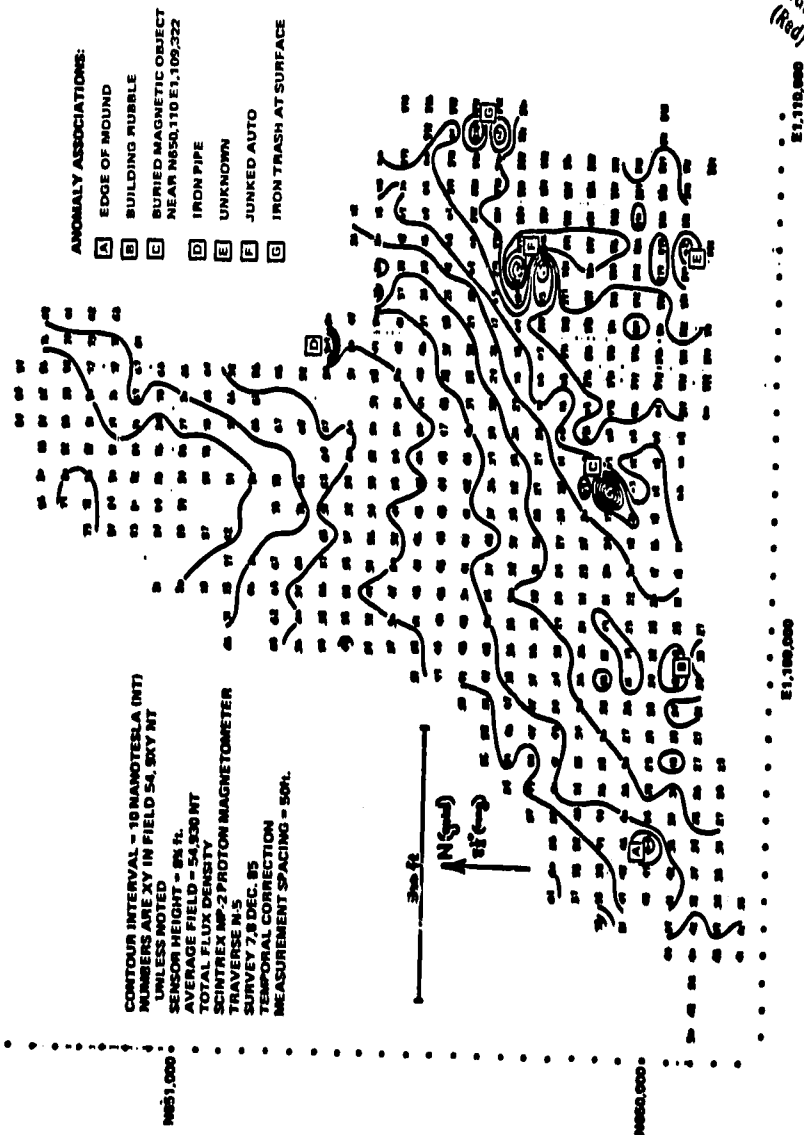


FIGURE 3-2
MAGNETIC MAP
OF THE WESTERN EXCAVATED AREA
3-9

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Dames & Moore

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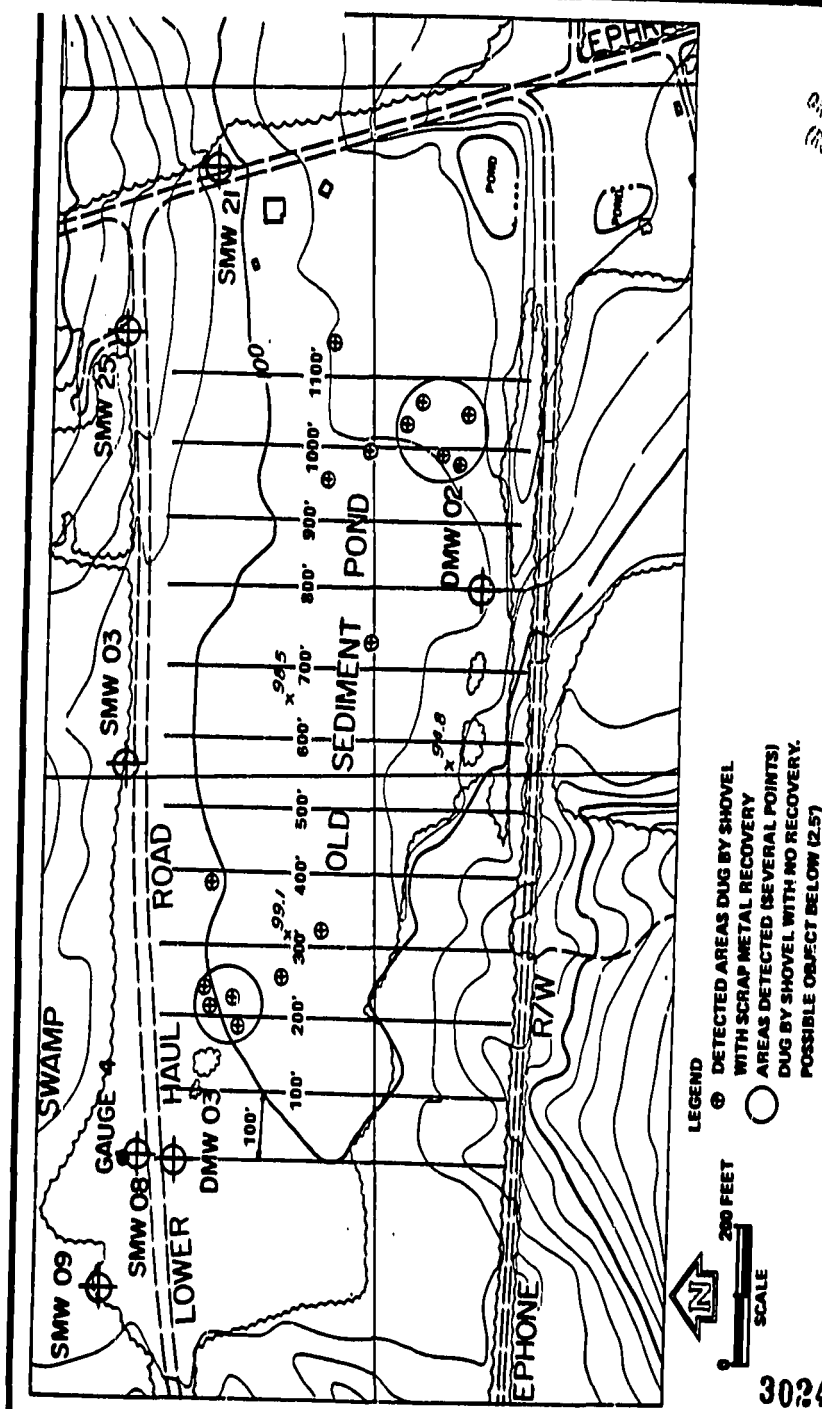


FIGURE 3 - 3
MAGNETIC LOCATOR SURVEY
OF OLD SEDIMENTATION POND

ORIGINAL
(Red)

Source & Map

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4.0 SOIL INVESTIGATION

4.1 DESCRIPTION OF ONSITE SOILS

A general soil map prepared by the U.S. Soil Conservation Service for Cecil County, Maryland (USDA/SCS, 1973), shows a spatial distribution of various soil associations--landscapes having a proportional pattern of one or more major soils and at least one minor soil. The soils in one association may occur in another but in a different pattern. There are nine soil associations in Cecil County.

The three soil associations at and within the vicinity of the site (as derived from the general soil map of Cecil County and the Phase I RI/FS report) in decreasing order of dominance are:

- Beltsville Association--Soils are deep, well-drained to moderately well drained, nearly level to steep, developed in old coastal plain deposits, and gravelly loamy sand to clay in texture.
- Sassafras-Woodstown Association--Soils are deep, well-drained to moderately well drained, gently rolling, and developed in loamy coastal plain deposits that overlie sand.
- Neshaminy-Montalto-Legore Association--Soils are deep, well-drained, gently sloping to steep, derived from basic rock, and loamy, clayey, and stony in texture.

The predominant soils in the study area are:

- Beltsville silt loam (BeB2 and BeC2)
- Evesboro loamy sand (EvB and EvD)
- Fallsington sandy loam (FaA)
- Rumsford loamy sand (RuC and RuD).

Because of prior sand and gravel extraction activities, the soils onsite have been extensively disturbed. Up to 30 feet of subsoil materials was removed during excavations when the site was used as a quarry. Test boring and monitoring well logs obtained during the preparation of the RAMP report by the NUS Corporation, the Phase I RI/FS report, and this report reveal that 12 to 19 feet of sand and gravel overlie a stiff, dry clay. The clay layer is approximately 10 to 15 feet thick, with surface dips toward the southeast and southwest. The clay layer is found across the site but may be locally discontinuous.

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ORIGINAL
(11-1)

4.1.1 Beltsville Series

The Beltsville series consists of nearly level to moderately sloping, moderately well-drained soils on the Coastal Plain, mostly in the central or north-central part of the county. These soils are predominantly yellowish-brown and loamy. They have a subsoil that is sticky in the upper part and firm to extremely firm and brittle in the lower part, which hinders the flow of moisture. The native vegetation is mixed hardwoods, including many white oaks and some pines.

In a representative profile, the surface layer is about 7 inches of yellowish-brown silt loam. The subsoil is about 39 inches thick: the upper 14 inches consists of yellowish-brown silt loam, and the lower 25 inches contains firm, yellowish-brown silty clay loam and sandy clay loam fragipan. The underlying material, to a depth of about 5 feet, is stratified fine sandy loam, loamy sand, or fine sand.

Beltsville soils are fairly easy to work at the right moisture content, but they are frequently wet in spring. Artificial drainage is needed for some uses, particularly on the more nearly level soils. Available moisture capacity is moderate. Water and roots do not readily penetrate the fragipan, and these soils dry more slowly than more permeable and porous soils.

If these soils are well managed, they are moderately well suited to crops. They are limited for some uses by slope, impeded drainage, a seasonally perched water table, very slow movement of subsoil moisture, and susceptibility to erosion. The water table and slow moisture movement make building sites seasonally wet and severely limit use of soils for septic tanks for disposal of sewage effluent.

4.1.2 Evesboro Series

The Evesboro series consists of very deep, excessively drained, nearly level to moderately steep soils of the uplands in the Coastal Plain part of Cecil County. These soils are sandy, but less sandy than the underlying material. Evesboro soils are formed mainly in old sand dunes. The native vegetation is chiefly scrub hardwoods, but pines grow in some places.

In a representative profile, the surface layer is about 4 inches of brown loamy sand. The subsoil, about 30 inches thick, is yellowish-brown loamy sand. It is underlain by yellowish-brown sand at a depth of between 34 and 60 inches.

Evesboro soils can be worked easily throughout a wide range of moisture content. They are very low in available moisture capacity and in natural plant nutrients.

These soils are fairly well suited to many field and truck crops, but most of the acreage is wooded. Cultivated areas are subject to soil blowing if the surface becomes dry and lacks a cover of protective vegetation. Evesboro soils make dry building sites, although they are loose. They are suitable for septic tanks, but effluent liquids generally move rapidly through them, acting as a pollution hazard to wells, streams, and downslope areas, particularly on strong slopes.

4.1.3 Fallsington Series

The Fallsington series consists of nearly level to moderately sloping, poorly drained soils on upland flats and at the heads of drainageways in the Coastal Plain part of the county. These soils are formed in old sandy sediment that contained considerable silt and clay. The native vegetation is mostly wetland hardwoods, such as oak, holly, birch, and swamp maple.

In a representative profile, the surface layer is about 11 inches of dark grayish-brown loam. The subsurface layer is about 5 inches of light brownish-gray loam. The subsoil, about 20 inches thick, is gray or light-gray friable sandy loam. Below this is about 19 inches of loose and olive-gray sand, or loamy sand.

Fallsington soils are easy to work except when they are very wet. Because water moves readily through these soils, they are not difficult to drain if adequate outlets are available. Tile drains generally work better than ditches in these soils. Ditches tend to cave in and fill with sand, especially if they penetrate into the loose sandy material beneath the solum. These soils have moderate to high available moisture capacity.

Fallsington soils are suited to many crops, but wetness, lack of natural drainage, and fluctuations in the water table limit use. Also, erosion is a hazard on the stronger slopes. Their wetness limits the use of these soils in septic tanks.

4.1.4 Rumford Series

The Rumford series consists of deep, gently to moderately sloping, often excessively drained soils on uplands in the Coastal Plain part of Cecil County. These soils are formed in sandy sediment that contain small amounts of clay, a little silt, and some fine, smooth gravel. The native vegetation is chiefly scrub hardwoods and Virginia pine, but shortleaf pine grows in some places.

In a representative profile, the surface layer is about 3 inches of very dark gray to dark grayish-brown loamy sand. Below this is a yellowish-brown loamy sand

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subsurface layer, about 8 inches thick, underlain by a friable, yellow-brown sandy loam subsoil to a depth of 34 inches. The underlying material is strong-brown loamy sand to a depth of 37 inches; mainly reddish-brown clay, silt, and sand to a depth of 44 inches; and brownish-yellow loose sand to a depth of 50 inches.

Rumford soils are easy to work. Because they are well drained, they are suitable for building sites and are also suitable for septic tank use, but are limited by slope in some areas.

The physical properties of the predominant soil series onsite and in the vicinity of the site are summarized in Table 4-1, which includes information on horizons, unified soil classifications, permeability as determined by the percolation test, available moisture capacity, optimal moisture and maximum dry density, and shrink-swell potential. This information forms a basis to facilitate determining the effectiveness and feasibility of appropriate remedial alternative options for the Phase II FS and defining design parameters and construction techniques for the implementation of the selected remedial measure.

4.2 SURFACE SOILS SCREENING STUDIES

Over 400 shallow (0 to 3 feet) soil samples were taken on a 50-foot grid to quickly assess the extent of surficial contamination in the 45-acre Western Excavated Area (Figure 4-1). Samples were obtained using a hand soil sampling auger, and VOC readings were immediately taken from each hole with an HNu Photoionization Detector (PID). Soil samples from each hole were composited, then placed in air-tight glass containers and allowed to stand for 24 hours in a warm location. After 24 hours, head-space readings were taken with an HNu (PID). Results of both "in-hole" and "head-space" analyses were placed on maps of the grid system to help delineate areas of high VOC concentrations (Figures 4-2 and 4-3). HNu readings from both hand auger holes and head space in soil sample jars, however, yielded low VOC concentrations throughout the study area. A few samples located in wooded areas supplied anomalously high readings, which are attributed to the presence of sassafras and pine tree roots. Therefore, based upon the surface soil "sniff" test, no detectable contaminants were found in the Western Excavated Area of the site.

4.3 SHALLOW BORINGS

Shallow soil borings, 8 feet in depth, were drilled to provide detailed information on the nature and concentration of contaminants in areas of probable

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high contamination as defined by the screening sampling, statistical analyses of sampling data, and geophysical measurements. Shallow borings were also drilled in the previously studied Eastern Excavated Area of the site to further define soil contamination (see Appendix I). In addition to the 8-foot borings, which provided more detail at the surface, four borings in the Western Excavated Area of the site were continued deeper--three to a depth of 72 feet and one to a depth of 42 feet. These boreholes not only provided information on possible downward contaminant migration, but also yielded valuable information on the stratigraphy of the Western Excavated Area. Three of these four borings (SB2, 3, and 4) were completed as monitoring wells D&M-02, 03, and 04, respectively, and were sampled during the groundwater sampling phase of the Phase II RI.

4.3.1 Sample Locations and Boring Logs

Thirty-eight shallow (typically 8 feet) boreholes were drilled by hollow-stem auger in the Western Excavated Area (Figure 4-4), and 15 were drilled in the Eastern Excavated Area (see Appendix I). Standard penetration tests were performed using an 18-inch split spoon and a 140-pound hammer at a 30-inch drop in accordance with ASTM D 1586 specifications. Blow counts for each 6-inch penetration were recorded, along with data on recoveries of split-spoon samples. The samples were collected at 2-foot intervals during the drilling of all boreholes. Entries were made in the borehole logs regarding sampling depth, blow counts, sample recovery, and moisture content. Soil and geological classification and physical properties observations included texture, grain size, fractions or traces of minerals present, gradation, color, structures, shrink-swell properties, and density or consistency of the dominant soil material. Physical properties tests performed are provided in Appendix F. Soil classification symbols were assigned to each sample based on these properties.

A typical lithologic profile of the 8-foot soil borings is shown in Figure 4-5; detailed shallow borehole logs are presented in Appendix B. A typical lithologic profile of the 72-foot boreholes and accompanying well construction details are shown in Figure 4-6; the remaining logs are presented in Appendix C.

4.3.2 Chemical Analyses Results

Representative soil samples were taken at 6 to 18 inches, 3 to 5 feet, and 5 to 8 feet below grade from all thirty-eight 8-foot boreholes, from three of the four 72-foot boreholes in the Western Excavated Area, and from all fifteen 8-foot boreholes in the Eastern Excavated Area. Chemical analyses were performed on a

total of 114 samples from the Western Excavated Area and 45 samples from the previously studied Eastern Excavated Area. All of the samples were analyzed onsite by the USEPA mobile laboratory for the following parameters--Hazardous Substance List (HSL) metals and VOC's. Test results for the Eastern Excavated Area are provided in Appendix I.

Twenty-three selected samples were analyzed by USEPA through the Contract Laboratory Program (CLP) to provide verification of the mobile lab analyses and the existence of the following parameters--HSL metals, VOC's, A&B/N extractable organic compounds, and pesticides/PCB's.

4.3.2.1 Mobile Laboratory Results. Examination of analyses performed on soil samples from the Western Excavated Area for organic compounds shows that detected compounds consist largely of acetone and methylene chloride. These compounds are commonly used as laboratory solvents, and these detections may be due to laboratory contamination. A complete list of samples with detected VOC's and their concentrations is shown in Table 4-2. Appendix E contains the results of all soil samples analyzed for both HSL metals and VOC's by the USEPA mobile laboratory and all available blank data associated with those analyses.

Daily blank analyses indicated that acetone contamination was not quantifiable below 100 ng/g with any great deal of reliability. Since many analyses revealed acetone below this quantity, the results reported are only approximations. The possible errors in the acetone results reported (listed on the acetone calibration range program sheets--1/9/86) were in the range of 20 to 400 ng/g, only borehole 29, sample 2 (with acetone at 1,250 ppb) was outside of this range. In addition, the large solvent front occasionally obscured or made integration difficult for the early appearing compounds acetone and methylene chloride. The compounds were also not completely resolved, and quantification often was performed by peak height measurement. Many samples exhibited unidentified volatile organics, which chromatographed between methanol and methylene chloride.

Metals analyses show no obvious signs of contamination. Although there is a wide variation in the concentrations of some metals, there seems to be no pattern to the high values. High values of one metal occur with corresponding low values of others.

Chromium concentrations detected in soil samples from borings may possibly be elevated above the natural range for chromium in soils at the WES; however, these concentrations are well below the upper end (1,000 mg/kg) of the concentration range reported by the USGS for natural background chromium concentrations observed in soil samples from the Eastern United States.

The boring locations from which the soil samples were collected are separated by distances of at least 50 feet and up to over 200 feet. Although all of these samples are from the northern portion of the WES, the sampling locations are sufficiently distant to warrant the interpretation that a source area for chromium contamination is not present at the WES. Soil samples vertically separated by distances of less than 3 feet exhibit changes in chromium concentrations by as much as 210-fold.

4.3.2.2 Independent Laboratory Results. Twenty-three samples selected in the field by EPA and Dames & Moore (based on geographic spread, depth, and timing of the mobile laboratory and the independent laboratory) were analyzed by Compuchem Laboratories to provide verification of the mobile lab analyses and the existence of extractable organics and pesticides/PCB's. Results of these analyses are presented in Table 4-3. Sampling locations are shown on Figure 4-4. Logs of the borings and wells are provided in Appendices B and C, respectively.

Acetone and methylene chloride were detected in most of the samples; however, these compounds are common laboratory solvents. Acetone was found in two of the five method blanks (12 and 15 ug/kg) and in five of the six instrument blanks (ranging from 5.03 to 13 ug/kg). Methylene chloride was found in all instrument blanks (ranging from 1.8 to 8.43) and method blanks (ranging from 2.23 to 16 ug/kg). It is believed that six of the 19 VOC fractions have acetone native to the sample, but methylene chloride is probably native to only one of the 19 samples (at 36 mg/kg).

Bis (2-ethylhexyl) phthalate (BEHP) was detected four times--three of which were in blanks as well as in samples. BEHP is commonly detected in samples of the present-day environment because of the rather ubiquitous occurrence of plastic products containing BEHP which are released to the natural environment, the occurrence of BEHP in manufacturing effluents, and the frequent occurrence of BEHP as a laboratory artifact. Facts concerning BEHP include:

- It has been suggested as a possible natural product in animals and plants (IARC Monograph, Some Industrial Chemicals and Dyestuffs, 29:269-94, 1982).
- BEHP is a plasticizer for polyvinyl chloride (PVC) and other polymeric materials (see above reference to IARC, 1982) which are commonly used during sample preparation within the laboratory environment. Based on personal communication with personnel at CompuChem Laboratories, it was reported that BEHP is a common laboratory artifact.
- Materials, such as environmental samples, contacting plastics containing BEHP may become contaminated with BEHP. In Japan, BEHP concentrations in foodstuffs in contact with PVC packaging material exhibited BEHP concentrations ranging from 0 to 68 ppm (USEPA, Ambient Water Quality Criteria for Phthalate Esters, EPA-440/5-80-067, pC-4, 1980).
- Typical environmental concentrations of BEHP include:

<u>Media</u>	<u>Concentration</u>
European Rivers	1 - 70 ppm ^a
Mississippi River Delta	0.069 ppm ^a
Lake Superior	200 ppm ^a
Chesapeake Bay	0.022 to 0.18 ppm ^b
Atmosphere (U.S.-Urban)	0.92 ppb ^c
Marine Fish and Shellfish	10 to 100 ppb ^a

While these concentrations undoubtedly reflect man's contamination, they are representative of the present-day environment. The only other compounds detected were chloroform and lindane--each found only one time at very low concentrations.

^aGiam, C.S., et al., Anal. Chem., 47:2225-9, 1975.

^bMurray, H.E., et al., Bull. Environ. Anal. Chem., 5:189, 1978.

^cBove, J.L., et al., Int. J. Environ. Anal. Chem., 5:189, 1978.

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4.3.2.3 Comparison of Results. Table 4-4 provides a comparison of the various data collected for the borings. It contains a list of all sampling points which had at least two of the following - data from an independent laboratory, the USEPA mobile laboratory, HNu data from boreholes and HNu data from headspace. There appears to be some correlation between high HNu readings in either the borehole or the head space of the sample jar and chemical results for volatile organics. Unfortunately, the samples in which the USEPA mobile laboratory detected high quantities of acetone and/or methylene chloride were not analyzed by the independent laboratory (borings 9-1, 18-1, and 20-1).

Conversely, several of the borings had high HNu readings corresponding to detections of volatiles in the samples analyzed by the independent laboratory, but the USEPA mobile laboratory data did not indicate the presence of any volatiles. There were not instances within the available data where all three analyses (HNu readings, independent laboratory analyses and USEPA mobile laboratory analyses) indicated the presence of volatiles.

4.4 SOIL INVESTIGATION SUMMARY

Over 400 shallow (0 to 3 feet) soil samples from the Western Excavated Area were analyzed for VOC's with an HNu PID, and no obvious contamination was found. Thirty-eight shallow (8 feet) and four deep (72 feet) boreholes were drilled in the Western Excavated Area for chemical analysis of soils. A total of 114 samples were analyzed by the USEPA mobile laboratory for HSL metals and VOC's, with no significant contamination found. In addition, 19 samples were analyzed by an independent laboratory for HSL metals, VOC's, A&B/N extractable organic compounds, and pesticides/PCB's, with similar results. Based on analyses performed during this study, the Western Excavated Area is interpreted as uncontaminated.

Geophysical studies (Section 3.0), surface soil sampling, and shallow borings (Section 4.0) performed for the Initial Phase II RI tasks did not encounter contamination source(s) or evidence of general surface contamination in the Western Excavated Area. Occurrences of VOC and metals contamination in the WEA appear to be minor, isolated events that are not related to waste disposal activity in the WEA or to activities in the EEA. The WEA is highly disturbed and was operated for many years as a sand and gravel pit. Many activities that were

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typical of such operations (fuel spills, on-ground engine oil disposal, trash disposal, etc.) could easily result in isolated pockets of surface soil contamination. Based on this likelihood, and the lack of waste disposal evidence, the WEA is presumed to contain no contamination sources. Subsequently, the USEPA deleted the waste investigation task from the Phase II RI.

TABLE 4-1
Engineering and Physical Properties of Soils

Soil Series	Horizons (inches from surface)	Unified Soil Classification ^a	Permeability (percolation test, in./hr)	Available Moisture Capacity (in./in.)	Moisture-Density		Shrink-Swell Potential
					Optimum Moisture (%)	Maximum Dry Density (lbs/ft ³)	
Beltsville	0-10	ML or CL	0.63-2.0	0.18-0.24	--	--	Low
	10-46	CL	< 0.20	0.12-0.18	10-15	111-120	Low to moderate
	46-60	SM or ML	0.63-6.3	0.08-0.12	10-15	111-125	Low
Evesboro	0-60	SM or SP-SM	> 6.3	0.04-0.06	10-14	101-115	Low
Fallsington	0-16	SM, SC, or ML	2.0-6.3	0.12-0.18	--	--	Low
	16-36	SM, SC, or ML	0.63-2.0	0.18-0.24	10-14	111-125	Low
	36-55	SM, SC, SP, or SP-SM	0.63-6.3	0.06-0.10	10-14	101-125	Low
Rumford	0-11	SM	> 6.3	0.06-0.08	--	--	Low
	11-34	SM or SC	> 6.3	0.12-0.18	7-8	111-125	Low
	34-44	SM	> 6.3	0.06-0.12	10-15	101-110	Low
	44-50	SP, SP-SM, or SM	> 6.3	< 0.06	8-12	91-110	Low

^aUnified Soil Classification System:

ML--Inorganic silts and very fine sands or clayey silts with slight plasticity
 CL--Inorganic clays of low to medium plasticity, silty clays
 SM--Silty sands, sand-silt mixtures
 SP--Poorly graded sands, gravelly sands, little or no fines
 SC--Clayey sands, sand-clay mixtures.

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TABLE 4-2
Summary of Volatile Organics Detected in the
Western Excavated Area
USEPA Mobile Laboratory

Bore No.	Sample No.	Volatile Organic	Concentration ^a (ng/g soil) (ppb)
5	3	Acetone ^b	
9	1	Acetone	362
18	1	Acetone	265
		Methylene chloride	169
24	3	Acetone	39.4
28	2	Acetone	130
29	2	Acetone	519
20	1	Acetone	1,250
		Methylene chloride	191
			29.1

^aConcentration = $\frac{\text{concentration in purged vial (ug/l)}}{\text{sample weight (grams)}} \times \text{ml water in vial}$

^bPossible errors in the acetone results reported (listed on the acetone calibration range program sheets--1/9/86) were in the range of 20 to 400 ng/g.

TABLE 4-3
Summary of Organic Compounds Detected in the
Western Excavated Area by Independent Laboratory

Boring or Well No.	Sample No.	Approximate Sample Depth (feet)	Acetone (ug/kg)	Methylene Chloride (ug/kg)	Bis (2-Ethylhexyl) Phthalate (ug/kg)	Chloroform (ug/kg)	Lindane (ug/kg)	Carbon Disulfide (ug/kg)	2-Butanone (ug/kg)
36	36-1	1	11 U ^b	5.4 B ^a	380 U	5.4 U	2.2 U	5.4 U	11 U
36	36-2	4	24	16 JCE	360 U	5.4 U	2.2 U	5.4 U	11 U
37	37-1	1	74	19 B	370 U	5.5 U	2.2 U	5.5 U	11 U
37	37-2	4	45	15 B	380 U	5.6 U	2.2 U	5.6 U	11 U
DEM-02	SB-2-1	1	6	9.4 B	360 U	5.3 U	2.1 U	5.3 U	11 U
DEM-02	SB-2-2	4	11 U	9.7	65	5.3 U	2 U	5.3 U	11 U
DEM-02	SB-2-3	7	19 B	12 B	360 U	5.3 U	2.1 U	5.3 U	11 U
DEM-02	SB-2-4	11	22 B	9.2 B	350 U	5.2 U	2.1 U	5.2 U	10 U
DEM-02	SB-2-5	16	10 B	3.4 JB	73 JB	5.1 U	2 U	5.1 U	5.1 U
DEM-03	SB-3-1	1	16 B	6.2 B	350 U	5.2 U	2 U	5.2 U	10 U
DEM-03	SB-3-2	4	26 B	4.8 JB	95 JB	5.4 U	2.2 U	5.4 U	11 U
DEM-03	SB-3-4	11	19 B	5.7	61 JB	5.1 U	2 U	5.1 U	10 U
DEM-03	SB-3-5	16	19 B	2.6 JB	35 J	5.2 U	2.1 U	5.2 U	10 U
DEM-03	SB-3-6	21	16 B	7.8 B	46 J	5.2 U	2.1 U	5.2 U	10 U
DEM-04	SB-4-1	1	35	36 B	360 U	5.3 U	2.1 U	5.3 U	10 U
DEM-04	SB-4-2	4	9.1 B	12 U	400 U	5.8 U	2.3 U	44	12 U
DEM-04	SB-4-4	11	8.8 J	10 B	390 U	5.7 U	2.3 U	5.7 U	11 U
DEM-04	SB-4-5	16	21	13 B	340 U	1.6 J	2 U	5.1 U	10 U
DEM-04	SB-4-6	21	12	4.7 JB	350 U	5.1 U	0.5 J	5.1 U	12

^aB = Found in blank as well as sample.

^bU = Under detection limits.

J = Estimated value.

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TABLE 4-4

Results for Multiply-Sampled Points - Western Excavated Area

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Boring or Well No.	Sample	Shallow Soil Samples NWU		B'-Borings, EPA Mobile		B'-Borings, Independent Laboratory (ug/kg)						
		Readings (ppm)		Lab (ug/kg)								
		Hand Auger	Head Space	Acet	MeCl	Acet	MeCl	Bis-2	Chlor	Lind	CBDI	2-But
1	1-1	0	2	ND	ND	NA	NA	NA	NA	NA	NA	NA
2	2-1	0	2	ND	ND	NA	NA	NA	NA	NA	NA	NA
3	3-1	0	0	ND	ND	NA	NA	NA	NA	NA	NA	NA
4	4-1	NA	3	ND	ND	NA	NA	NA	NA	NA	NA	NA
5	5-1	NA	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
6	6-1	NA	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
7	7-1	1	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
8	8-1	70	6	ND	ND	NA	NA	NA	NA	NA	NA	NA
9	9-1	1	2	265	ND	NA	NA	NA	NA	NA	NA	NA
10	10-1	NA	2	ND	ND	NA	NA	NA	NA	NA	NA	NA
11	11-1	3	2	ND	ND	NA	NA	NA	NA	NA	NA	NA
12	12-1	NA	2	ND	ND	NA	NA	NA	NA	NA	NA	NA
13	13-1	0	2	ND	ND	NA	NA	NA	NA	NA	NA	NA
14	14-1	NA	2	ND	ND	NA	NA	NA	NA	NA	NA	NA
15	15-1	16	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
16	16-1	35	2	ND	ND	NA	NA	NA	NA	NA	NA	NA
17	17-1	48	3	ND	ND	NA	NA	NA	NA	NA	NA	NA
18(a)	18-1	16	2	169	39.4	NA	NA	NA	NA	NA	NA	NA
19	19-1	5	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
20	20-1	3	1	191	29.1	NA	NA	NA	NA	NA	NA	NA
21	21-1	3	0	ND	ND	NA	NA	NA	NA	NA	NA	NA
22	22-1	7	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
23	23-1	5	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
25	25-1	0	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
27	27-1	3	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
28	28-1	3	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
29	29-1	15	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
31	31-1	3	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
32	32-1	0	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
33	33-1	1	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
34	34-1	NA	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
35	35-1	0	1	ND	ND	NA	NA	NA	NA	NA	NA	NA
36	36-1	NA	1	ND	ND	ND	5.4 B	ND	ND	ND	ND	ND
36	36-2	NA	NA	ND	ND	24	14 J	ND	ND	ND	ND	ND
37	37-1	0	1	ND	ND	74	19 B	ND	ND	ND	ND	ND
37	37-2	NA	NA	ND	ND	45	15 B	ND	ND	ND	ND	ND
SBM-02	SB-2-1	0	1	ND	ND	16	9.4 B	ND	ND	ND	ND	ND
SBM-02	SB-2-2	NA	NA	ND	ND	ND	9.7	65 J	ND	ND	ND	ND
SBM-02	SB-2-3	NA	NA	ND	ND	19 B	12 B	ND	ND	ND	ND	ND
SBM-02	SB-2-4	NA	NA	ND	ND	22 B	9.2 B	ND	ND	ND	ND	ND
SBM-02	SB-2-5	NA	NA	ND	ND	10 B	3.4 J	73 J	ND	ND	ND	ND
SBM-03	SB-3-1	NA	1	NA	NA	16 B	6.2 B	ND	ND	ND	ND	ND
SBM-04	SB-4-1	16	2	ND	ND	35	36 B	ND	ND	ND	ND	ND
SBM-04	SB-4-2	NA	NA	ND	ND	9.1 B	ND	ND	ND	ND	44	ND

Key: Acet - Acetone

MeCl - Methylene Chloride

Bis-2 - Bis(2-ethylhexyl)phthalate

Chlor - Chloroform

Lind - Lindane

CBDI - Carbon Disulfide

2-But - 2-Butanone

Flags: NA - Not Analyzed

ND - Not Detected

J - Approximated value

B - This flag is used when the analyte is found in the blank.

(a) - Boring SB-4 was sampled in two efforts--on Boring 18, and during the completion of Well SBM-04 (SB-4). Hand auger and head space NWU readings were only taken during the earlier effort, but included in SB-4 for comparison.

30251.0

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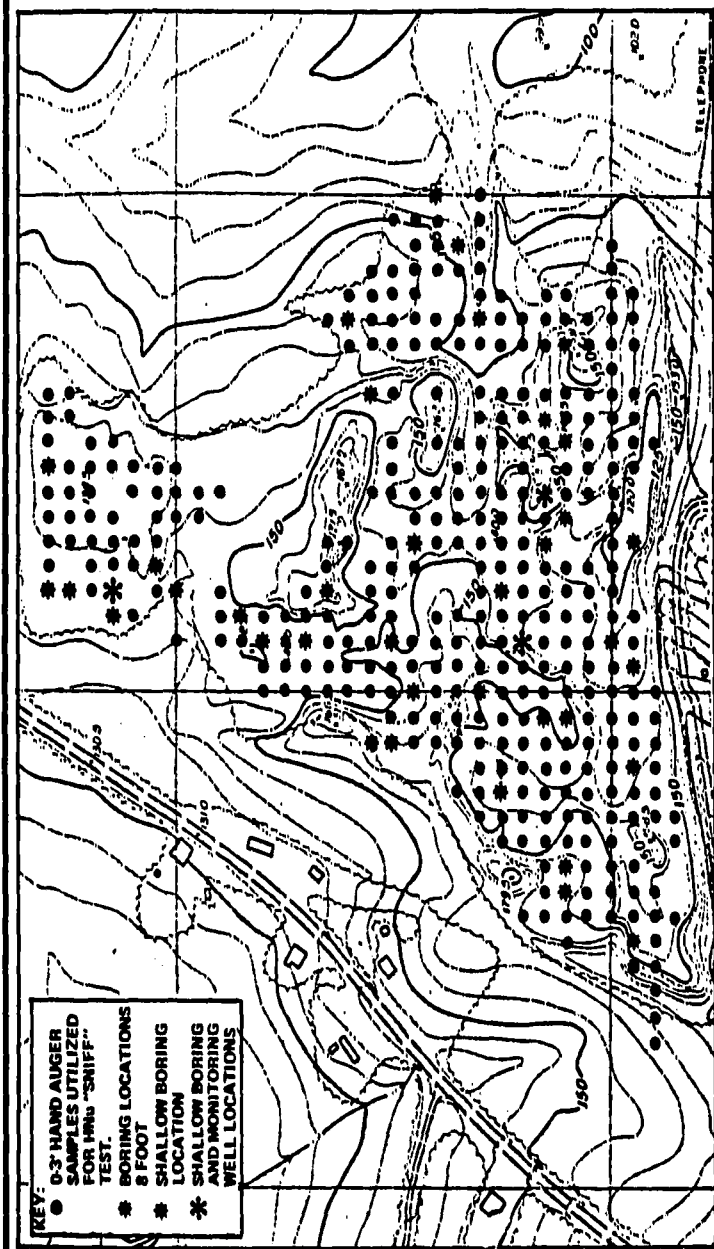
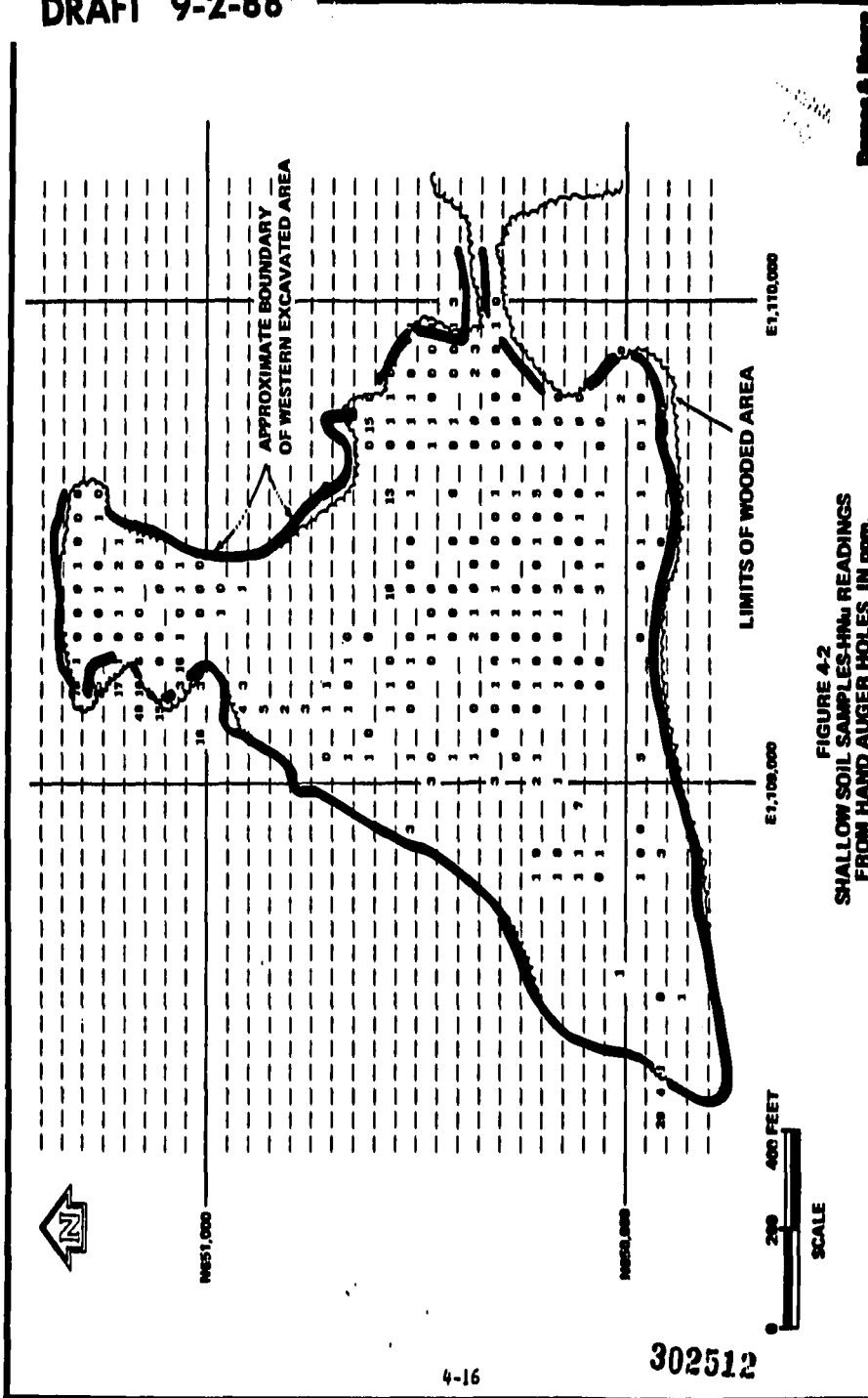


FIGURE 4-1
LOCATIONS OF SHALLOW SOIL SAMPLES
AND SHALLOW BORINGS-WESTERN EXCAVATED AREA

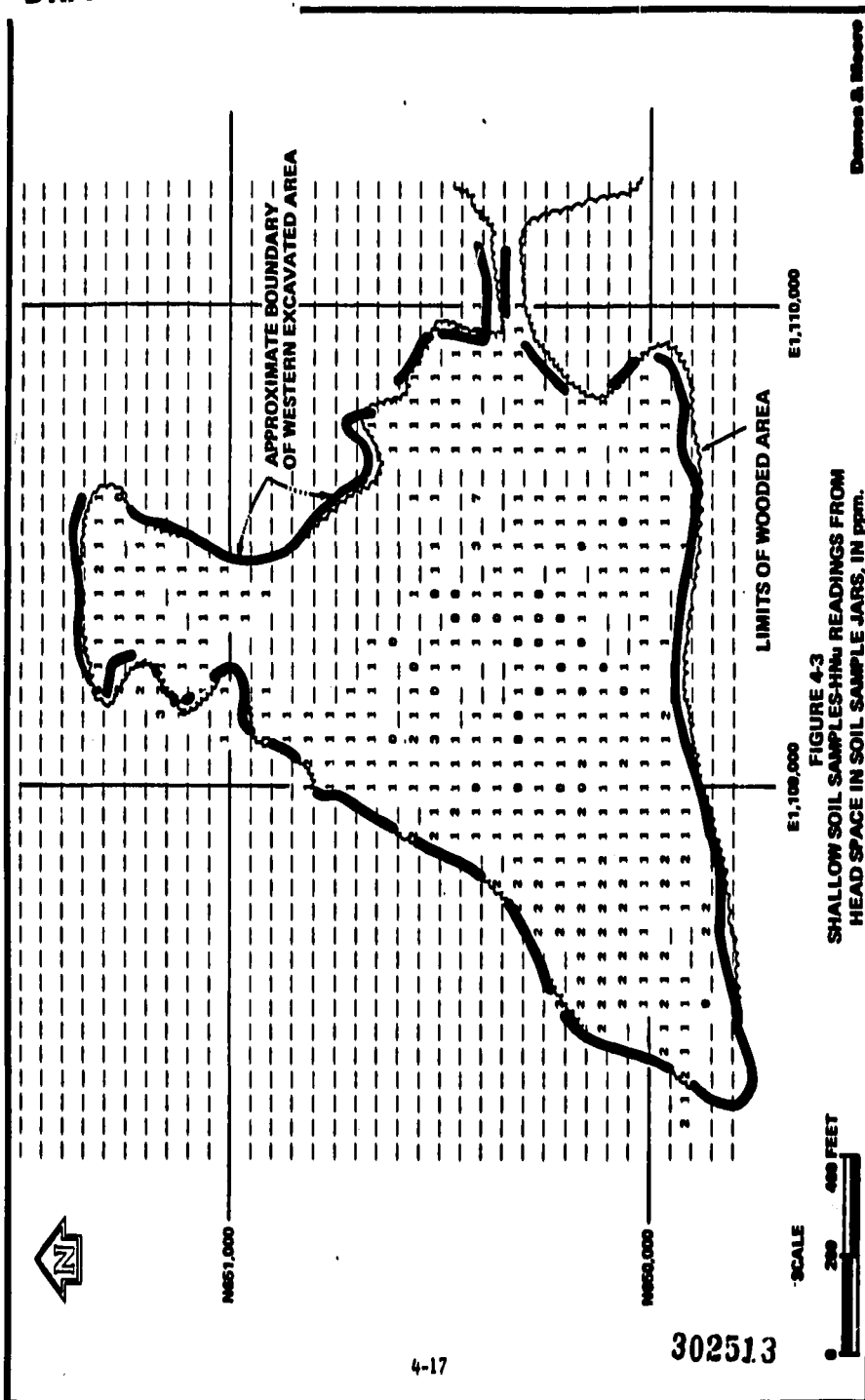
Dames & Moore

302511

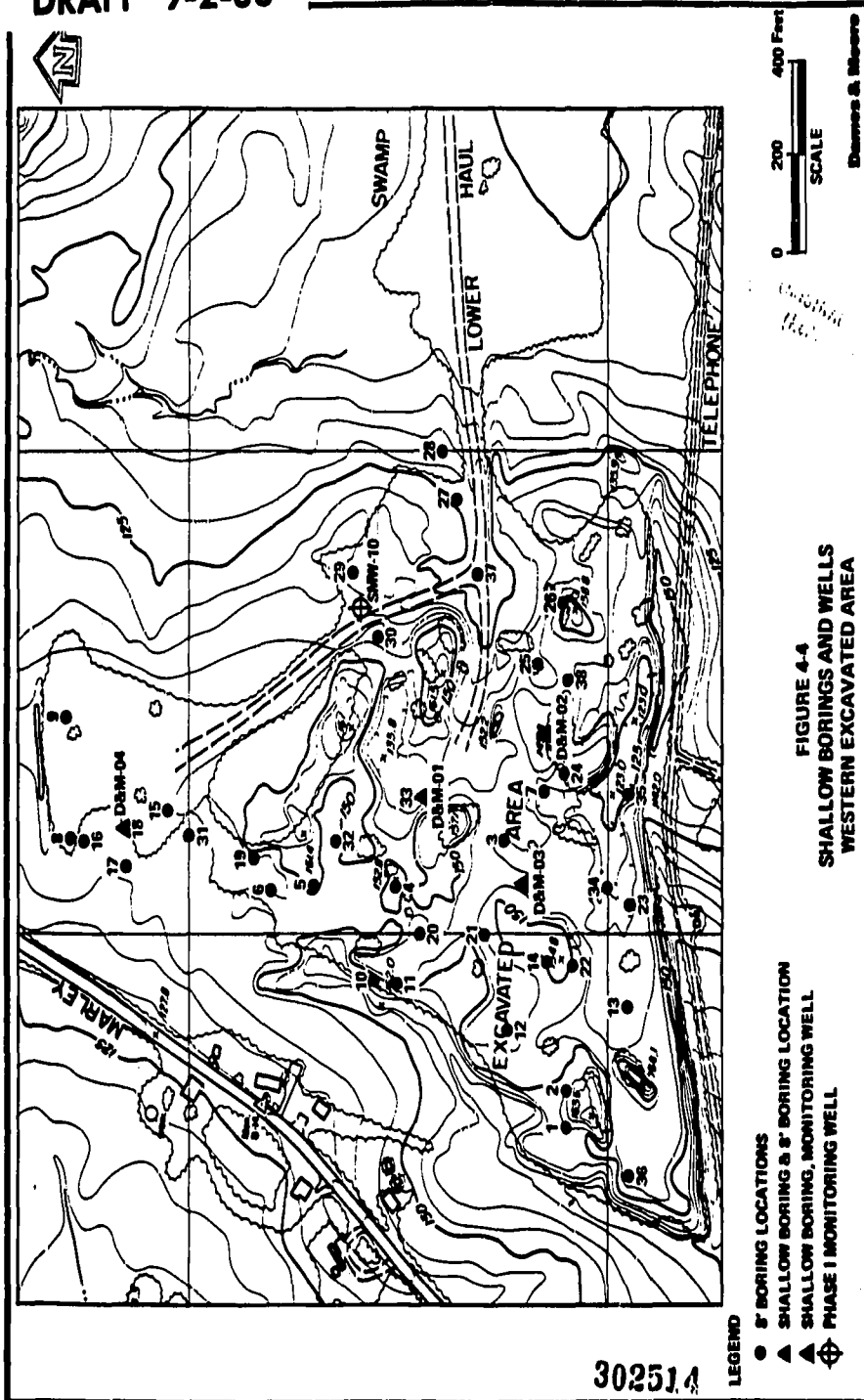
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DRAFT 9-2-88

BORING 5

Surface Elevation:
Location: Elkton, Md.

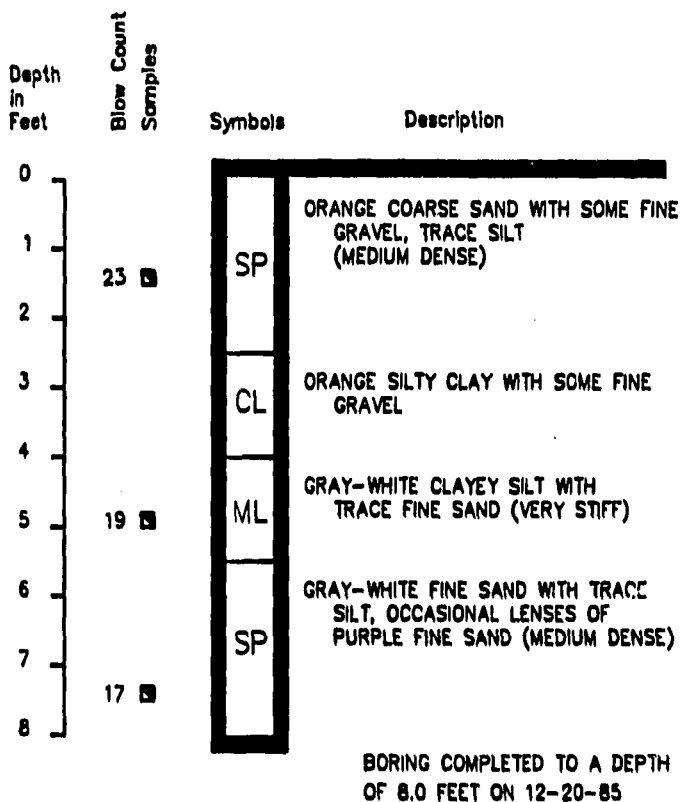


FIGURE 4-5
LOG OF BORING - TYPICAL 8-FOOT BORING

30251.5

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MONITORING WELL

PERMIT NUMBER: CE-91-1911

8" PROTECTIVE
CASING, 8' LONG

GROUT

4" PVC

BENTONITE
PELLETS

GRAVEL PACK

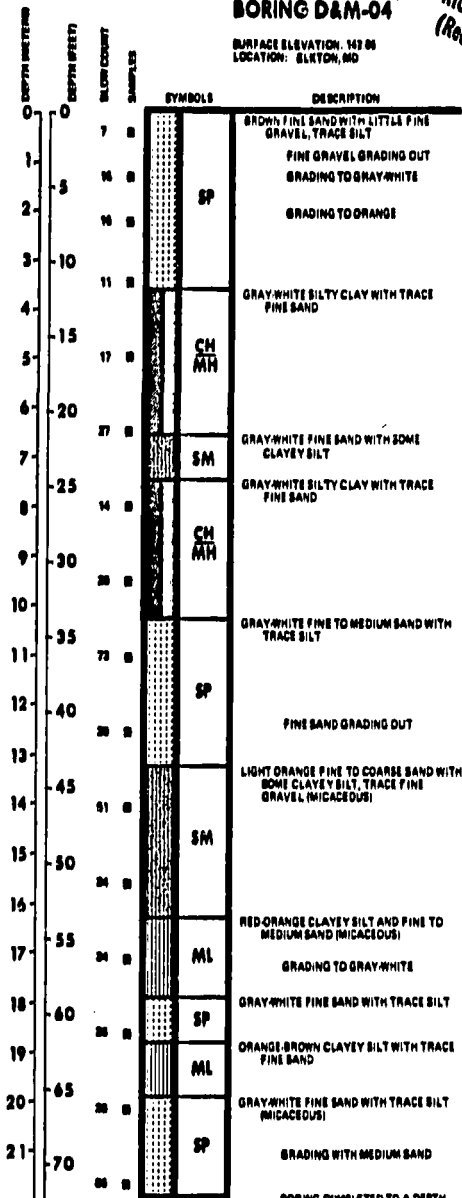
WELL SCREEN

BORING D&M-04

SURFACE ELEVATION: 142.00

LOCATION: ELKTON, MD

ORIGINAL
(Red)



BORING COMPLETED TO A DEPTH OF 72.0 FEET ON 1-14-88

GROUNDWATER ENCOUNTERED AT A DEPTH OF 86.0 FEET ON 1-13-88

MONITORING WELL INSTALLED TO A DEPTH OF 70.6 FEET ON 1-14-88

GROUNDWATER ENCOUNTERED AT A DEPTH OF 82.8 FEET ON 4-10-88

FIGURE 4-8
LOG OF BORING - TYPICAL 72-FOOT BORING

302516

6.0 SURFACE WATER AND SEDIMENT INVESTIGATION**6.1 SURFACE WATER DRAINAGE PATTERNS AT MSGS**

Surface water from the site is collected by two intermittent streams--the western and eastern tributaries of Mill Creek and by several isolated ponds. The tributaries merge at the southeastern corner of the site. Mill Creek flows southeast from the site, turns east after crossing the railroad, and becomes a tributary of Elk Creek. Elk Creek drains into Elk River and consequently into Chesapeake Bay. The regional drainage pattern is shown in Figure 6-1.

As shown in Figure 6-2, the major surface water features onsite and in the immediate vicinity includes:

- Standing water bodies--The three ponds in the Eastern Excavated Area that were used for waste disposal (ponds P01, P02, and P03) and several small low-lying areas occasionally filled with water. The ponds in both the Eastern and Western Excavated Areas are isolated from any regular surface drainage pathways by the irregular topography of the old borrow pit.
- Streams--The Mill Creek tributaries, numerous seeps or springs, and several unnamed intermittent streams.
- Wetlands--The Sedge Meadow Area, a swampy area, the Old Sedimentation Pond, and the eastern edge of the Western Excavated Area on Old Haul Road--all contain wetlands vegetation--and some areas may meet criteria for wetlands. Supplemental bioassessment and wetlands reports are in preparation

The onsite seeps, streams, and other drainage pathways flow sluggishly in winding courses toward Mill Creek. Four distinctive units are present within the surface water drainage of the site. These units are discussed below in relation to the western and eastern tributaries of Mill Creek.

6.1.1 Onsite Surface Drainage Unit 1

This unit originates from the Eastern Excavated Area near pond P01 (see Figure 6-2). Surface runoff generally drains southward toward the Lower Haul Road, where it joins several seeps located along the wooded slopes to the south and

southwest of pond P01 and north of the Lower Haul Road. These seeps flow southwest and south before draining into two surface water subunits--1) the swamp and 2) a ditch along the northern edge of Lower Haul Road. The swamp is a portion of the headwaters of the western tributary of Mill Creek.

The western and eastern tributaries of Mill Creek join Mill Creek approximately 100 feet east of the intersection of Ephrata Lane and the telephone right-of-way, then flow east and southeast to Little Elk Creek, a tributary of the Elk River. The Elk River eventually empties into the Chesapeake Bay, approximately 10 miles southwest of the site.

6.1.2 Onsite Surface Drainage Unit 2

This unit originates from the Eastern Excavated Area near pond P02. Surface runoff generally flows east toward the eastern tributary of Mill Creek. An intermittent seep (approximately 4 feet wide by 70 feet long) in a north-south orientation is located in a wooded area approximately 80 to 100 feet east of and downgradient from pond P02 (see Figure 6-2). This seep joins surface water runoff and flows southeast, eventually into the eastern tributary of Mill Creek.

6.1.3 Onsite Surface Drainage Unit 3

This unit originates from an area encompassing the northwestern portion of the Eastern Excavated Area, which contains pond P03 (see Figure 6-2). Surface runoff generally discharges to the western tributary of Mill Creek. Southwest of and downgradient from pond P03 and the Sedge Meadow Area, numerous seeps form a seep path approximately 15 to 25 feet wide in a north-south orientation, coinciding with the western tributary of Mill Creek. This tributary flows south to a swampy area just north of Lower Haul Road. When the surface water elevation in the swamp exceeds the ground elevation of the flat area immediately west of the Old Sedimentation Pond, it flows across the flat area, through the Old Sedimentation Pond, then into a creek south of that pond and along the northern edge of the telephone right-of-way. At other times, water flows from the swamp as groundwater toward the creek along the northern edge of the telephone right-of-way and toward the eastern tributary to Mill Creek.

6.1.4 Onsite Surface Drainage Unit 4

The Western Excavated Area drains as a single unit to the western terminus of the Lower Haul Road. Flow then trends east along the Lower Haul Road, joining flow from drainage unit 1 into the western tributary of Mill Creek.

6.2 SAMPLING LOCATIONS

Nine sediment and seven surface water samples were collected during the Phase II RI. Stations 01 through 06 were in the Western Excavated Area and reflect drainage from only that area. Stations 07 through 09 were at locations along the western tributary to Mill Creek and receive runoff from both the Eastern and Western Excavated Areas as well as offsite areas.

Stations SW/SED-01 through SW/SED-04 were in isolated ponds in the Western Excavated Area. Stations SED-05 and SED-06 were in dry intermittent drainage ways in the Western Excavated Area that conduct stormwater runoff. Station SW/SED-07 was in the swamp adjacent to the Lower Haul Road. Station SW/SED-08 was in an intermittent stream that parallels the telephone right-of-way. This stream was dry during the late summer and early fall of 1987 but was flowing in the late fall. Station SW/SED-09 is on the western tributary to Mill Creek between the Sedge Meadow Area and the swamp. Sample locations are shown in Figure 6-3. Surface water and sediment samples were collected at each location, except at stations SED-05 and SED-06, for which sediment only was taken. At each location where a water sample was collected, the water sample was collected first, then the sediment sample.

A list of the sample designations, locations, descriptions, and dates is provided in Tables 6-1 and 6-2.

6.3 RESULTS OF ANALYSES

The seven surface water samples and nine sediment samples were analyzed for Target Compound List (TCL) volatiles, semivolatiles, pesticides/PCB's, and metals. Tables 6-3 and 6-4 give the analytical results (found concentrations only) for surface water and sediment, respectively. The complete results are presented in Appendix E.

The following substances were detected in one or more surface water samples in the concentrations shown:

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ORIGINAL
(Req)

<u>Substance</u>	<u>Western Excavated Area</u>	<u>Western Tributary to Mill Creek</u>
<u>Metals</u>		
Beryllium	1.7 ug/l, 1 sample	Not detected
Copper	13 to 16 ug/l, 3 samples	12 ug/l, 1 sample
Lead	Not detected	2.8 ug/l, 1 sample
Thallium	1.3 ug/l, 1 sample	1.2 ug/l, 1 sample
Zinc	18 to 38 ug/l, 4 samples	20 to 39 ug/l, 3 samples
Barium	5.8 to 44 ug/l, 4 samples	24 to 28 ug/l, 3 samples
Iron	52 to 520 ug/l, 4 samples	172 to 355 ug/l, 3 samples
Manganese	85 to 940 ug/l, 4 samples	98 to 141 ug/l, 3 samples
Vanadium	1.6 to 4 ug/l, 4 samples	4.2 to 5.9 ug/l, 3 samples
Aluminum	28 to 177 ug/l, 4 samples	90 to 154 ug/l, 3 samples
Cobalt	6.3 to 16 ug/l, 4 samples	3.2 to 7.9 ug/l, 3 samples
Magnesium	421 to 1,030 ug/l, 4 samples	2,080 to 2,400 ug/l, 3 samples
Calcium	528 to 1,620 ug/l, 4 samples	3,620 to 4,470 ug/l, 3 samples
Sodium	1,490 to 4,240 ug/l, 4 samples	7,460 to 9,590 ug/l, 3 samples
Potassium	2,470 to 4,620 ug/l, 3 samples	4,920 to 6,470 ug/l, 3 samples
<u>Volatiles</u>		
Methylene chloride	3 ug/l, 1 sample	3 to 6 ug/l, 2 samples

Methylene chloride was also found in the method blanks that were analyzed in conjunction with these samples; therefore, this compound may be an analytical artifact. No other volatiles were found in surface water samples. No semivolatile TCL compounds or pesticides/PCB's were detected in any of the seven surface water samples collected in this investigation.

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Method volatile blanks for the seven surface water samples indicated contamination in 1/4 blanks. Methylene chloride was detected at a concentration of 33 ug/l in the blank associated with SW-02. Semivolatile and pesticide blanks showed no contamination.

Preparation blanks for metal analysis indicated the following contamination levels:

<u>Associated Samples</u>	<u>Contaminants</u>	<u>Concentration (ug/l)</u>
SW-01, SW-03, SW-04, SW-09	Cobalt	5.1
	Magnesium	362
	Potassium	4,610
	Sodium	3,530
	Vanadium	4.21
	Zinc	5.3
SW-02, SW-07, SW-08	Magnesium	351
	Potassium	4,240
	Selenium	2.8
	Sodium	2,240
	Thallium	4.5

All positive metals values were greater than or equal to the instrument detection limit but less than the contract-required detection limit and bore the "V" flag.

Hardness of the surface water samples from the site tended to be quite low and fell into two groups--isolated ponds in the Western Excavated Area and tributaries to Mill Creek. Hardness of the isolated ponds (SW-01, SW-02, SW-03, and SW-04) varied from 3 to 8 mg CaCO_3/l , and hardness of the tributaries to Mill Creek (SW-07, SW-08, and SW-09) varied from 18 to 21 mg CaCO_3/l . Specific conductance was also low and may be divided into the same two classes. Specific conductance of the isolated ponds varied from 22 to 65 umhos/cm, and specific conductance of the tributaries to Mill Creek varied from 91 to 99 umhos/cm. The lower values of hardness, specific conductance, and total metals content in waters of the isolated ponds are indicative of the dependence of these ponds on recent rainfall for their existence.

ORIGINAL
(10-2)

Tributaries of Mill Creek at MSGS are Maryland Class I waters (Code of Maryland Regulations, Title 10, Subtitle 30, Chapter 1, Section .02); however, the isolated ephemeral ponds onsite are unclassified, since they do not qualify as waters of the state. Maryland regulations establish specific water quality criteria for certain pesticides (aldrin-dieldrin, benzidine, DDT, endrin, and toxaphene) and PCB's--none of which were detected in any of the seven samples collected during the Phase II RI. The regulations also establish specific water quality criteria for fecal coliform bacteria, dissolved oxygen, temperature, pH, and turbidity. Of these, only pH is pertinent to the present investigation. All of the three samples collected from the tributaries to Mill Creek had pH values that were less than the standard of 6.5; however, this probably results from natural conditions.

Ambient water quality criteria for the protection of freshwater aquatic life offer a means of comparison for some of the metals detected in surface water samples at the site (beryllium, copper, lead, thallium, and zinc), although these criteria are only advisory (Federal Register, 1980). Comparison of these criteria (listed in Table 6-3) to the analytical results indicates exceedances of the criterion for copper in four samples. The sample from SW-09 exceeded the criterion; however, the sample from the swamp downstream from SW-09, SW-07, contained no detectable copper. Three of the samples collected from ponds in the Western Excavated Area (SW-01, SW-03, and SW-04) exceeded the calculated criterion for copper. Since these ponds are isolated from other surface water features and do not appear to support significant biotic communities, it is unlikely that the exceedance of the copper criterion is significant.

The following substances were detected in one or more sediment samples in the concentrations shown:

<u>Substance</u>	<u>Western Excavated Area</u>	<u>Western Tributary to Mill Creek</u>
<u>Metals</u>		
Arsenic	0.52 to 1.9 mg/kg, 3 samples	0.39 to 1 mg/kg, 2 samples
Beryllium	0.42 mg/kg, 1 sample	0.44 mg/kg, 1 sample
Cadmium	Not detected	1.5 mg/kg, 1 sample
Chromium	0.31 to 41 mg/kg, 5 samples	1.9 to 87 mg/kg, 3 samples

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ORIGINAL
(12-8)

Copper	2.5 to 7.9 mg/kg, 3 samples	4 to 10 mg/kg, 2 samples
Lead	0.5 to 4.5 mg/kg, 5 samples	1.8 to 3.6 mg/kg, 2 samples
Thallium	0.23 to 0.36 mg/kg, 3 samples	Not detected
Zinc	4.1 to 16 mg/kg, 5 samples	6.5 to 19 mg/kg, 3 samples
Barium	0.81 to 16 mg/kg, 4 samples	1.7 to 14 mg/kg, 3 samples
Iron	671 to 10,900 mg/kg, 5 samples	344 to 12,100 mg/kg, 3 samples
Manganese	1.4 to 27 mg/kg, 4 samples	1.9 to 21 mg/kg, 3 samples
Vanadium	3.2 to 36 mg/kg, 5 samples	1 to 59 mg/kg, 3 samples
Aluminum	99 to 5,680 mg/kg, 5 samples	199 to 4,100 mg/kg, 3 samples
Magnesium	66 to 338 mg/kg, 2 samples	135 mg/kg, 1 sample
Calcium	42 to 80 mg/kg, 5 samples	60 to 173 mg/kg, 3 samples
<u>Volatiles</u>		
Benzene	Not detected	2 ug/kg, 1 sample
Chloroform	2 ug/kg, 1 sample	2 to 5 ug/kg, 2 samples
Methylene chloride	15 to 47 ug/kg, 6 samples	25 to 29 ug/kg, 3 samples
Tetrachloroethene	9 ug/kg, 1 sample	Not detected
Acetone	10 to 38 ug/kg, 6 samples	15 to 43 ug/kg, 3 samples

ORIGINAL
(100)

<u>Substance</u>	<u>Western Excavated Area</u>	<u>Western Tributary to Mill Creek</u>
<u>Semivolatiles</u>		
4-Methylphenol	Not detected	280 ug/kg, 1 sample
Bis (2-ethylhexyl) phthalate	43 to 76 ug/kg, 2 samples	Not detected

All of the metals detected in these samples were within the range of natural variability for soils in the eastern United States, as reported in Schacklette and Boerngen (1984). This is further discussed in Section 7.0.

Volatile organics detected in sediment samples included two common laboratory contaminants--methylene chloride and acetone--in all nine samples. Since these compounds were also detected in the method blanks, these compounds are probably analytical artifacts. The other volatiles--benzene, tetrachloroethene, and chloroform--were detected in low concentrations and in just a few samples. The semivolatile organic compounds--bis (2-ethylhexyl)-phthalate and 4-methylphenol--were detected in two and one samples, respectively, at low concentrations. Tentatively identified compounds were reported for one sample only--SED-08, which contained two unknown semivolatiles at concentrations of 160 and 540 ug/kg. The occurrence of a larger number of compounds and in greater concentrations in sediments versus surface water could be due to the adsorptive properties of sediments.

None of the TCL pesticides or PCB's were detected in any of the sediment samples.

Method blanks for the volatile analyses for the nine sediment samples indicated contamination in 3/3 blanks. Metals preparation blanks showed contamination in 4/5 blanks. All positive results for metals preparation blanks were greater than or equal to the instrument detection limit, but less than the contract required detection limit and bore the "V" flag. The results of these blank analyses and their associated samples are listed below. Semivolatile and pesticide blanks showed no evidence of laboratory contaminants.

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ORIGINAL
(1-2)

<u>Associated Samples</u>	<u>Contaminants</u>	<u>Concentration (ug/l)</u>
SED-01	Methylene chloride	10
	Acetone	10
	2-Hexanone	13
SED-02	Methylene chloride	11
	Acetone	11
SED-03, SED-04, SED-09	Methylene chloride	16
	Acetone	12
SED-05, SED-06, SED-08	Methylene chloride	6
	Acetone	73
	Benzene	13
SED-07	Methylene chloride	16
	Acetone	28
SED-01	Cobalt	2.1
	Copper	2.6
	Magnesium	110
	Manganese	0.93
	Potassium	375
	Selenium	0.90
	Sodium	8,431
	Vanadium	1.2
	Zinc	0.50
SED-02, SED-05, SED-06	Arsenic	0.32
	Calcium	4.1
	Iron	2.0
	Magnesium	24
	Sodium	247
	Zinc	0.54
SED-03, SED-09	Iron	1.8
	Zinc	0.67
SED-04	Aluminum	7.5
	Iron	1.6
	Zinc	1.9

ORIGINAL
(lead)

6.4 SUMMARY

Surface water and sediment sampling in the Phase II RI focused on isolated ponds in the Western Excavated Area and on stream drainage that lies between the Eastern and Western Excavated Areas. Overall, water quality in the areas sampled is within acceptable limits, and no problem areas were indicated. The surface water samples contained a variety of metals and were further characterized by low hardness and a pH of 3.7 to 5.6; however, the pH is probably representative of natural conditions (precipitation in the region has a pH of 3 or less). Concentrations of copper exceeded the ambient water quality criterion for the protection of freshwater aquatic life in four samples. This exceedance is not considered significant, since copper exceedances occurred in waters of little apparent biotic importance.

Sediment samples contained concentrations of metals that were within the range of natural variability. Low concentrations of TCL volatile and semivolatile organic compounds were present in some of the samples.

No TCL pesticides/PCB's were detected in any surface water or sediment samples collected during Phase II.

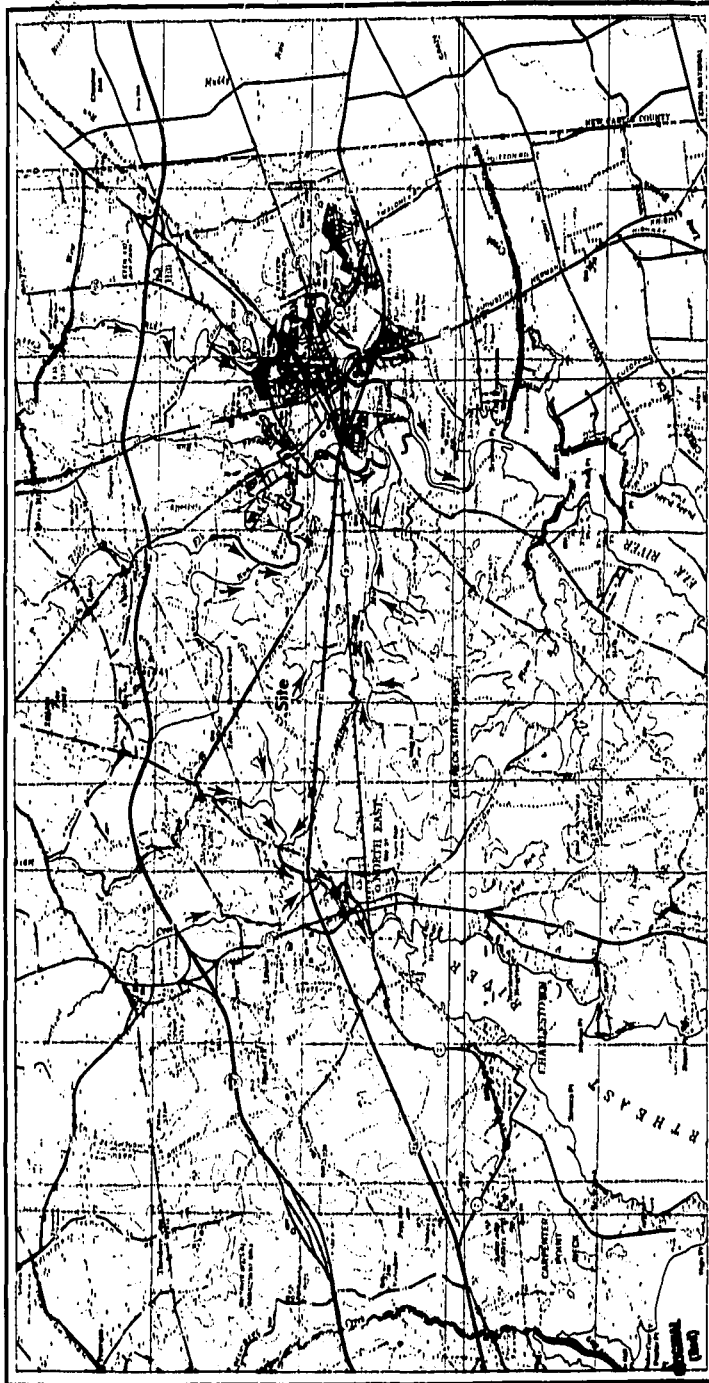


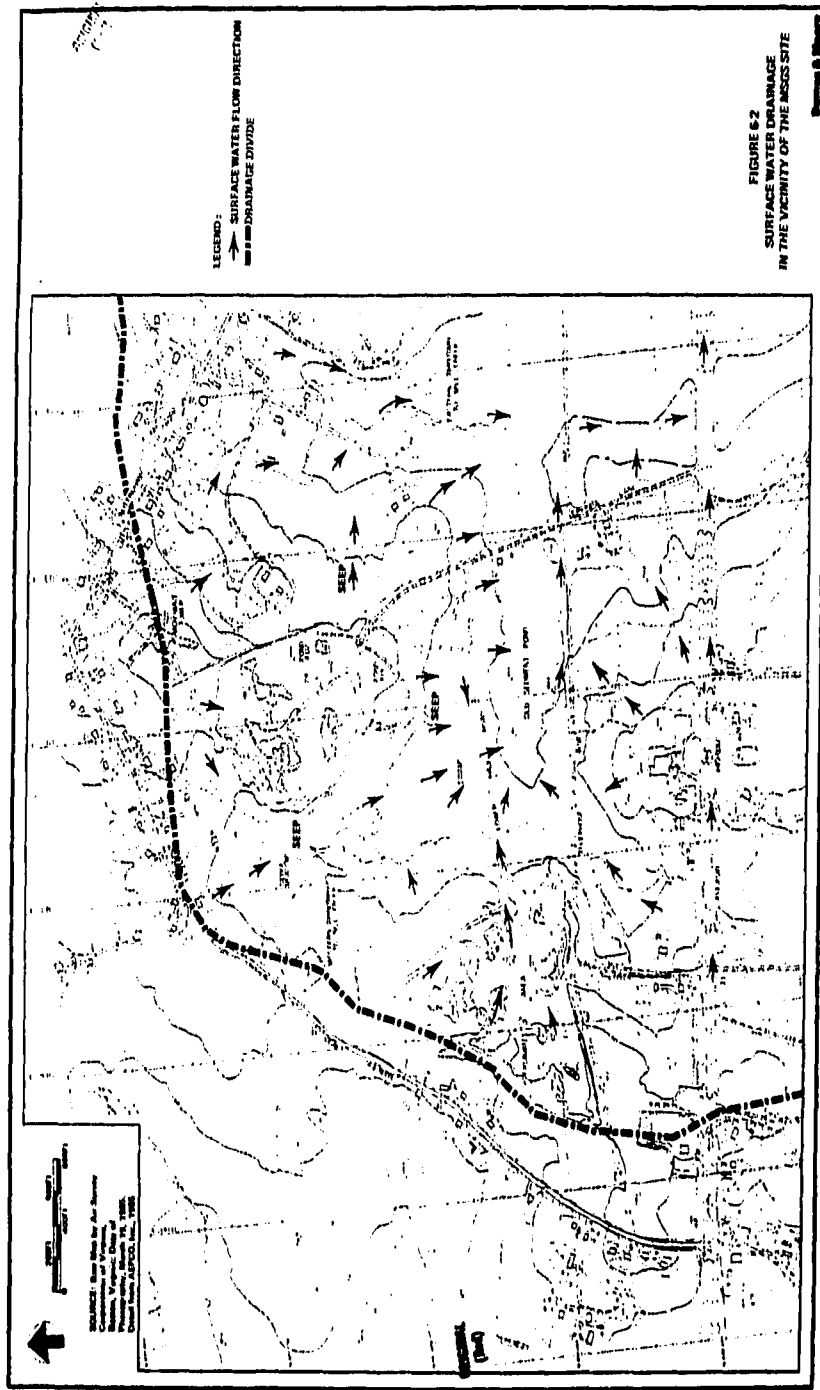
FIGURE 6.1
SURFACE WATER DRAINAGE
IN THE ELKTON/NORTH EAST AREA

* Town of North East Surface Water Intake
□ Town of Elkton Surface Water Intake

1 MILE
SCALE

SOURCE: HYDROGRAPHIC MAP OF DELAWARE, 1977 AND 1978 (U.S. GEOLOGICAL SURVEY)

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302520

FIGURE 6-3
SURFACE WATER AND SEDIMENT
SAMPLING LOCATIONS

Source: S. Moore

